ธนาคารแห่งประเทศไทย

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โครงสร้างทางเศรษฐกิจที่เหมาะสมและการเจริญเติบโตในระยะยาวของประเทศไทย

Economic Arrangements and Long-Term Growth in Thailand

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บทสรุป

ข้อคิดเห็นที่ปรากฏในบทความนี้เป็นความเห็นส่วนตัวของผู้เขียนโดยเฉพาะ ซึ่งไม่จำเป็นต้องสอดคล้องกับนโยบายของธนาคารแห่งประเทศไทย

เหตุที่คนไทยโดยเฉลี่ยมีรายได้เพียงหนึ่งในห้าของชาวอเมริกันทั่วไปนั้น เป็นเพราะโดยเฉลี่ยแล้วประสิทธิภาพในการผลิตของประชากรแรงงานไทยที่ทำงานมีเพียงหนึ่งในห้าของคนงานอเมริกัน ทั้งนี้เมื่อวัดโดยปรับพื้นฐานของความสามารถในการซื้อของค่าเงินให้เท่ากัน (Purchasing Power Parity) การศึกษานี้มุ่งถึงหลักฐานที่ว่าระดับของประสิทธิภาพการผลิตมีความสัมพันธ์อย่างยิ่งยวดกับระบบการจัดการทางเศรษฐกิจที่แต่ละสังคมเลือก โดยเฉพาะที่เกี่ยวเนื่องกับ*ความสามารถ*และ*แรงจูงใจ*โดยรวมของสังคมที่จะกีดกันมิให้มีการนำเทคโนโลยีที่ดีกว่ามาใช้ และ การเลือกใช้เทคโนโลยีที่มีอยู่อย่างไม่มีประสิทธิภาพต่อไป การกีดกันซึ่งอาจมีต้นตอมาจากความต้องการผูกขาดผลประโยชน์หรือการคอร์รัปชั่นนี้เป็นอุปสรรคที่ประเทศไทยและประเทศกำลังพัฒนาอื่นๆกำลังประสบอยู่ ผู้เขียนเชื่อว่าหากประชาชนมีสิทธิในการถือครองทรัพย์สิน หากระบบภาษีไม่บิดเบือน และรัฐบาลสามารถรักษาเสถียรภาพของเศรษฐกิจมหภาคไว้ได้แล้ว ถ้าประชาชนและภาคธุรกิจสามารถนำเทคโนโลยีที่ดีที่สุดมาใช้ หรือสามารถเลือกจัดการเทคโนโลยีที่มีอยู่ให้มีประสิทธิภาพสูงสุดได้อย่างเสรี บุคคลทั่วไปและภาคธุรกิจจะมีทำการสะสมทุน (Physical Capital) และสร้างบุคลากร (Human Capital) ที่จำเป็นในการบริหารจัดการเทคโนโลยีเหล่านั้นอย่างมีประสิทธิภาพเอง ประสิทธิภาพการผลิตก็จะเพิ่มสูงขึ้นและประเทศต่างๆ จะมีรายได้สูงขึ้น และร่ำรวยมากขึ้นเองโดยลำดับ จากการศึกษาผลกระทบของโครงสร้างของระบบเศรษฐกิจโดยปรับ (Calibrate) ข้อมูลจริงของประเทศไทยและสหรัฐฯ มาใช้ในแบบจำลองในรูปแบบของทฤษฎี General Equilibrium และทฤษฎีเกมพบว่าผลการคำนวณจากแบบจำลองดังกล่าวสามารถอธิบายความแตกต่างระหว่างผลิตภาพรวม (Total Factor Productivity) ในระยะยาวของประเทศไทยและสหรัฐฯซึ่งมีอยู่ประมาณ 3 เท่าได้ ผลการศึกษาชี้ถึงประโยชน์ของการเพิ่มผลิตภาพรวมโดยการเปลี่ยนโครงสร้างของระบบเศรษฐกิจไทยเพื่อลดช่องว่างของรายได้ระหว่างประเทศ โดยมีนัยของการส่งเสริมการแข่งขัน มีการค้าขายและการลงทุนระหว่างประเทศที่เปิดกว้างมากขึ้น มีกฎหมายป้องกันการร่วมมือเพื่อผูกขาดทางธุรกิจ (Antitrust Law) ที่มีประสิทธิภาพ ตลอดจนการขจัดกฎเกณฑ์ที่ลดแรงจูงใจทางเศรษฐกิจออกไปเสีย

บทสรุปผู้บริหาร
โครงสร้างทางเศรษฐกิจที่เหมาะสมกับการเจริญเติบโตในระยะยาวของประเทศไทย

เหตุที่คนไทยโดยเฉลี่ยมีรายได้เพียงหนึ่งในห้าของชาวอเมริกันทั่วไป นั้น เป็นเพราะโดยเฉลี่ยแล้วประสิทธิภาพในการผลิตของประชากรแรงงานไทยที่ทำงานมีเพียงหนึ่งในห้าของคนงานอเมริกัน เมื่อวัดโดยปรับพื้นฐานของความสามารถในการซื้อของค่าเงินให้เท่ากัน (Purchasing Power Parity) ความแตกต่างในประสิทธิภาพการผลิตนี้เป็นเหตุที่คนทั่วไปในห้าประเทศที่ร่ำรวยที่สุดมีรายได้มากเป็นสามสิบเท่าของคนในห้าประเทศที่ยากจนที่สุด ข้อเท็จจริงอีกประการหนึ่งคือ ความแตกต่างของประสิทธิภาพการผลิตนั้นมีมากเมื่อเทียบในระดับระหว่างประเทศ บทความนี้มีเป้าหมายเพื่อศึกษาถึงสาเหตุของความแตกต่างในการพัฒนาที่เกิดขึ้นและวิธีการที่จะลดความแตกต่างดังกล่าวลงในระยะยาว

การศึกษานี้มุ่งถึงหลักฐานที่ว่าระดับของประสิทธิภาพการผลิตมีความสัมพันธ์อย่างยิ่งยวดกับระบบการจัดการทางเศรษฐกิจที่แต่ละสังคมเลือก โดยเฉพาะที่เกี่ยวเนื่องกับความสามารถและแรงจูงใจโดยรวมของสังคมที่จะกีดกันมิให้มีการนำเทคโนโลยีที่ดีกว่ามาใช้ และ การเลือกใช้เทคโนโลยีที่มีอยู่อย่างไม่มีประสิทธิภาพต่อไป แรงขัดขวางการนำเทคโนโลยีที่ดีกว่ามาใช้นี้ นับเป็นปัญหาสำคัญของประเทศกำลังพัฒนา รวมถึงประเทศไทยที่ประสบปัญหานี้อยู่ในปัจจุบัน

โดยหลักแล้ว ผู้เขียนเชื่อว่าประเทศที่ยากจนนั้น ยากจนเพราะมีระบบผูกขาดมากเกินไป แม้ว่าการค้นคว้าพัฒนาเทคโนโลยีใหม่ๆอาจจะต้องอาศัยการผูกขาดในระดับหนึ่ง แต่การรับเอาเทคโนโลยีที่ผู้อื่นคิดค้นแล้วมาใช้โดยเฉพาะกรณีของประเทศที่ยากจน นั้นไม่จำเป็นต้องอาศัยการผูกขาดมาใช้เป็นแรงจูงใจทางเศรษฐกิจแต่อย่างใด

ผู้เขียนเชื่อและสามารถแสดงให้เห็นได้โดยใช้แบบจำลองทางเศรษฐกิจว่าหากประชาชนมีสิทธิในการถือครองทรัพย์สิน หากระบบภาษีไม่บิดเบือน และรัฐบาลสามารถรักษาเสถียรภาพทางมหภาคของระบบเศรษฐกิจไว้ได้แล้ว บุคคลทั่วไปและภาคธุรกิจจะมีความสามารถในการสะสมทุน (Physical Capital) และการสร้างศักยภาพทางบุคลากร (Human Capital) ที่จำเป็นในการบริหารจัดการเทคโนโลยีอย่างมีประสิทธิภาพ ถ้าประชาชนและภาคธุรกิจสามารถนำเทคโนโลยีที่ดีที่สุดมาใช้ หรือสามารถเลือกจัดการเทคโนโลยีที่มีอยู่ให้มีประสิทธิภาพสูงสุดได้อย่างเสรี ประสิทธิภาพการผลิตก็จะเพิ่มสูงขึ้นและประเทศต่างๆ จะมีรายได้สูงขึ้น และร่ำรวยมากขึ้นเองโดยลำดับ

ในปัจจุบันความเข้าใจเกี่ยวกับสาเหตุของการเจริญเติบโตทางเศรษฐกิจเริ่มชัดเจนมากขึ้น นักเศรษฐศาสตร์เริ่มเห็นพ้องกันมากขึ้นว่าความแตกต่างระหว่างการเจริญเติบโตทางเศรษฐกิจของแต่ละประเทศ *ในระยะยาว* นั้นอาจมิได้มีสาเหตุมาจากความแตกต่างของปริมาณทุนและ / หรือปริมาณสินทรัพย์ทางปัญญาเป็นหลัก ทั้งนี้เนื่องจากเมื่อเทียบรายได้ต่อหัวของประเทศที่ร่ำรวยกับของประเทศที่ยากจนกว่านั้น ไม่พบว่าปริมาณทุนสะสม (ไม่ว่าจะเป็นทุนทางกายภาพ หรือทุนที่ไม่สามารถจับต้องได้เช่นการศึกษาหรือสินทรัพย์ทางปัญญา) ของทั้งสองกลุ่มประเทศนี้ต่างกันมากพอที่จะอธิบายความแตกต่างส่วนใหญ่ของรายได้ต่อหัวของสองกลุ่มประเทศนี้แต่อย่างใด ความแตกต่างของรายได้ต่อหัวของประเทศที่ไม่สามารถอธิบายได้ด้วยความแตกต่างของปริมาณทุนและสินทรัพย์ทางปัญญานั้น รู้จักกันในชื่อของผลิตภาพการผลิตรวม (Total Factor

Productivity) ซึ่งเป็นส่วนที่นักเศรษฐศาสตร์ให้ความสำคัญมากในการค้นคว้าหาสาเหตุของความไม่เท่าเทียมกันทั้งในเชิงระดับและอัตราการเจริญเติบโตทางเศรษฐกิจระหว่างประเทศ

หลักฐานทางประวัติศาสตร์รวมถึงบทวิจัยของนักเศรษฐศาสตร์ชั้นนำในระยะเวลาสิบปีที่ผ่านมาพบว่าโครงสร้างของระบบเศรษฐกิจที่ปิดกั้นมิให้มีการนำเทคโนโลยีที่ดีกว่ามาใช้ และใช้เทคโนโลยีที่มีอยู่อย่างไม่เต็มประสิทธิภาพ อาจเป็นสาเหตุสำคัญสาเหตุหนึ่งซึ่งทำให้การเจริญเติบโตของผลิตภาพการผลิตรวมไม่ดีเท่าที่ควร ตัวอย่างเช่นในช่วง 10 ปีก่อน จำนวนโทรศัพท์ต่อประชากรในประเทศไทยอยู่ต่ำกว่าประเทศเอเชียหลายๆ ประเทศ ทั้ง ๆ ที่เทคโนโลยีการวางสายโทรศัพท์นั้นก็เป็นเทคโนโลยีที่สามารถเรียนรู้จากต่างประเทศได้ง่าย และความสามารถทางเทคนิคของวิศวกรไทยก็มิน่าจะด้อยกว่าประเทศอื่น ปัจจุบันเมื่อมีการแข่งขันมากขึ้นการให้บริการโทรศัพท์พื้นฐานก็ดีขึ้นโดยลำดับ ผู้เขียนเชื่อว่าเพียงมีการแข่งขันในทุกๆอุตสาหกรรมแล้วนั้นประสิทธิภาพในการผลิตและให้บริการในอุตสาหกรรมนั้นก็จะเพิ่มขึ้นโดยไม่จำเป็นต้องเพิ่มปัจจัยการผลิตในระบบแต่ประการใด

การศึกษาในครั้งนี้ผู้เขียนใช้แบบจำลองเพื่อศึกษาว่าโครงสร้างเศรษฐกิจที่ปิดกั้นมิให้มีการนำเทคโนโลยีที่ดีกว่ามาใช้ดังกล่าวนั้นจะส่งผลต่อความเจริญเติบโตระยะยาวของเศรษฐกิจไทยอย่างไร แบบจำลองดังกล่าวนี้ศึกษาผลกระทบของโครงสร้างของระบบเศรษฐกิจโดยใช้ทฤษฎี General Equilibrium และทฤษฎีเกม ผู้เขียนได้แบ่งระบบเศรษฐกิจออกเป็น 2 ภาค คือ (1) ภาคเศรษฐกิจที่ได้รับการปกป้องจากรัฐ หรือภาคที่ไม่มีการเปิดให้แข่งขันกันอย่างเสรี เช่น อุตสาหกรรมบางประเภท สถาบันการเงิน รัฐวิสาหกิจ ฯลฯ จัดว่าเป็นภาคเศรษฐกิจที่มีโครงสร้างแบบปฏิเสธการนำเทคโนโลยีที่ดีที่สุดมาใช้ ซึ่งการปิดกั้นนี้มิจำเป็นต้องเกิดจากการรวมตัวของกลุ่มแรงงานเพียงอย่างเดียว แต่อาจเกิดจากการปกป้องทางกฎหมาย ข้อกำหนด หรือการให้ใบอนุญาตต่างๆ ตลอดจนการใช้กลยุทธ์ของผู้ประกอบการในภาคอุตสาหกรรมเหล่านั้น ที่ในที่สุดแล้วทำให้ไม่มีการแข่งขันอย่างเพียงพอ และ (2) ภาคเศรษฐกิจซึ่งมีการแข่งขันกันอย่างเสรีไม่มีการกีดกัน เช่นภาคเกษตร อุตสาหกรรมย่อย ฯลฯ

แบบจำลองดังกล่าวนี้แสดงให้เห็นว่าภาคอุตสาหกรรมที่ได้รับการปกป้องจะไม่นำเทคโนโลยีการผลิตที่ดีที่สุดมาใช้อย่างมีประสิทธิภาพ ณ จุดดุลยภาพ แต่จะเลือกเทคโนโลยีขั้นรองลงมา หรือใช้เทคโนโลยีที่มีอยู่อย่างไม่มีประสิทธิภาพ เพื่อที่จะรักษาอัตราค่าแรง*และ*การจ้างงานในภาคอุตสาหกรรมให้สูงไว้ ซึ่งการไม่ใช้เทคโนโลยีในการผลิตที่ดีที่สุดจะทำให้ผลผลิตของทั้งระบบเศรษฐกิจมีไม่มากเท่าที่ควร โดยเมื่อนำแบบจำลองมาปรับเทียบ (Calibrate) ให้เข้ากับข้อมูลต่างๆ ของประเทศไทย เช่น สัดส่วนของแรงงานและค่าแรงในภาคเศรษฐกิจทั้งเสรีและไม่เสรี สัดส่วนรายได้ค่าเช่าที่ดิน ค่าแรงในภาคเศรษฐกิจที่เสรี รวมทั้งสัดส่วนของสินค้าขั้นกลางในทั้งสองภาคเศรษฐกิจ ฯลฯ แล้วคำนวณหาดุลยภาพของเกมและระบบเศรษฐกิจ พบว่า ความสามารถและแรงจูงใจของกลุ่มผลประโยชน์ในภาคการผลิตที่ปิดกั้นมิให้มีการนำเทคโนโลยีที่ดีที่สุดในการผลิตมาใช้อย่างมีประสิทธิภาพทำให้ผลผลิตรวมของประเทศในระยะยาวลดลงอย่างมาก เมื่อเทียบกับการเปิดให้มีการแข่งขันเสรี*ทั้งระบบ*เศรษฐกิจ (การแข่งขันเสรีมีนัยว่าจะมีการนำเทคโนโลยีที่ดีที่สุดมาใช้เนื่องจากผู้ผลิตต้องการประสิทธิภาพในการผลิตที่ดีที่สุด โดยไม่ได้มีการปกป้องผลประโยชน์ทางเศรษฐกิจของบุคคลบางกลุ่มเป็นสำคัญ) เมื่อผู้เขียนทดลองใช้ข้อมูลของระบบเศรษฐกิจสหรัฐอเมริกา (ซึ่งเป็นประเทศตัวอย่างที่ส่งเสริมให้มีการแข่งขันเสรี) มาคำนวณหาดุลยภาพเพื่อเปรียบเทียบกับประเทศไทย ผู้เขียนพบว่าโครงสร้างของระบบเศรษฐกิจที่ปฏิเสธมิให้มี

การนำเทคโนโลยีที่ดีกว่ามาใช้ และใช้เทคโนโลยีที่มีอยู่อย่างไม่เต็มประสิทธิภาพนั้น ทำให้ประเทศไทยมีระดับผลิตภาพรวม (TFP) ต่ำกว่าสหรัฐอเมริกาในระยะยาวอย่างน้อย 3 เท่า ซึ่งสอดคล้องกับตัวเลขระดับผลิตภาพรวมที่ได้จากข้อมูลจริง

ตัวอย่างของผลดีจากการลดการปิดกั้นการใช้เทคโนโลยีที่เห็นได้ในชีวิตประจำวันมีเช่นการอนุญาตให้มีการจดทะเบียนรถแท็กซี่ในกรุงเทพฯ อย่างเสรีโดยมีการควบคุมคุณภาพที่ชัดเจนในช่วง 10 ปีที่ผ่านมา ก่อนนั้นแท็กซี่ในกรุงเทพฯมีปริมาณไม่มากเนื่องจากปริมาณทะเบียนถูกจำกัดไว้ (ราคาป้ายทะเบียนอาจแพงกว่าราคารถ) รถส่วนมากเป็นรถเก่าซึ่งบางคันไม่มีเครื่องปรับอากาศ แต่เจ้าของอู่ไม่มีแรงจูงใจให้ต้องเปลี่ยนรถใหม่ อัตราค่าโดยสารขึ้นอยู่กับการต่อรอง เมื่อมีการเปิดเสรีการจดทะเบียนรถแท็กซี่แล้วเจ้าของอู่มีแรงจูงใจที่จะเปลี่ยนรถใหม่ที่จะดึงดูดผู้บริโภค (ซึ่งช่วยลดมลภาวะไปด้วยในตัว) ขณะเดียวกันอัตราค่าโดยสารกลายเป็นอัตรามาตรฐานซึ่งช่วยผู้บริโภคให้ได้ราคาที่ยุติธรรมยิ่งขึ้น

ผลจากแบบจำลองดังกล่าวยังบ่งชี้ว่า หากประเทศไทยยังคงโครงสร้างเศรษฐกิจที่ไม่เปิดให้มีการแข่งขันเสรีอยู่ต่อไป ระดับความแตกต่างของรายได้ประชาชาติเฉลี่ยระหว่างคนไทยกับคนอเมริกันอาจเพิ่มขึ้นได้ในระยะยาว

ผลที่ได้จากแบบจำลองชี้ให้เห็นถึงประโยชน์ของนโยบายที่สนับสนุนการเปิดเสรีของตลาดระหว่างประเทศ และกฎหมายที่ส่งเสริมการแข่งขันเสรีในประเทศ ตลอดจนการขจัดกฎเกณฑ์อันเป็นอุปสรรคต่อการแข่งขัน (Antitrust Policy: นโยบายป้องกันการร่วมมือทางธุรกิจที่นำความเสียหายไปสู่ผู้บริโภค) แต่โดยที่ยังมีการคุ้มครองผู้บริโภคอยู่ ผู้เขียนเชื่อว่าการสะสมทุน (Physical capital accumulation) รวมไปถึงการศึกษา และการฝึกฝนทักษะที่จำเป็นในการทำงาน (Human capital accumulation and skill acquisition) นั้น จะเกิดขึ้นเองจากความต้องการของตลาด โดยที่รัฐควรจะมีบทบาทในการให้บริการช่วยเหลือทางการศึกษาและฝึกฝนทักษะ แต่รัฐมิควรทำลายแรงจูงใจทางธุรกิจของภาคเอกชน ไม่ว่าโดยทางตรงหรือทางอ้อม

Section I: Introduction

The underlying reason why the average Thai earns approximately 5 times less than the average American in the 1990s is that the typical Thai worker is less productive than her American counterpart by a factor of roughly 5, as measured in international dollars.[1] The same logic applies to today's rich-poor divide, in which the average person in the richest 5 countries earns more than her counterpart from the 5 poorest countries by a factor of 30 when incomes are measured with the Summers and Heston purchasing power parity prices. This cross-country difference in worker productivities is significantly larger than the intra-country difference in worker productivities in general. Our paper is concerned with this economic phenomenon, specifically with what causes it and what needs to be done to narrow it.

There are many competing theories that claim to explain international income differences. Some are deep and worth exploring while many are outright useless. We reject any explanation of these differences along the line of culture and physical geography for a simple reason that culture is not exogenous to economic behavior and "distance from the equator" carries no viable policy implication.[2] Rather, our thesis centers on the evidence that the time path of productivity levels is highly correlated with the economic arrangement a society chooses, specifically apropos of the *ability* and *incentive* of organized forces in a society to resist the adoption of superior technology and persist in inefficient usage of currently operating ones. This resistance -- surfacing through large scopes of rent seeking, corruption and theft -- is a significant source of impediments facing the developing world today.

In essence, we believe that poor countries are poor not because they have inadequate monopolies, but rather because they harbor too many of them. While innovation may require a degree of monopolistic power, as Schumpeter theorized, technical adoption, which is more relevant insofar as poor countries are concerned, does not. Assuming that well-defined property rights, non-expropriating tax regimes, and macroeconomic stability are in place, our thesis is that sans these protected monopoly rights, individuals and firms will accumulate any human and physical capital necessary to operate superior technologies efficiently and countries will all be rich.

Using a game-theoretic model in the general equilibrium framework of Parente and Prescott (1997) and calibrating it to Thailand and US's growth facts, we find that the discrepancy in total factor productivity (TFP) levels between Thailand and the US, the magnitude of which is approximately 3, can be captured by the model's long-term predictions. Moreover, predictions of model aggregates also mimic what is known to be

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[1] We look at the most recent figures available from the Penn World Table 6.0; that is 1998. We also take average to cover the periods of boom and bust in both economies in the 1990s and check that data for 1990, 1997 (for obvious reasons) and, most recently, 1998 are consistent with this average; they are. The factors are 10 and 13 times, respectively, in 1950. The values used to represent incomes and average labor productivities are real GDP per capita at purchasing power parity (PPP), chain method, and real GDP per worker at PPP. All data from the recently updated Summers and Heston Penn World Table 6.0, which can be downloaded at http://pwt.econ.upenn.edu/.

[2] The French philosopher Montesquieu (1689-1755) suggested that one of the explanations of the divide between the productive North and the unproductive South had to do with the weather patterns in these locations. Hall and Jones (1998) has a regression that places "distance from the equator" as an instrumental variable and finds it to be closely related to long-run output-per-worker.

true along crucial dimensions in the data. We find that Thailand's *long-term* gross domestic product is higher by a factor of *at least* 3.1 under the "free enterprise" arrangement than under the protected "monopoly rights" arrangement that it adopts today. The increase in gross domestic product of this nature is tantamount to the increase in TFP of the same magnitude, as inputs remain unchanged. We then draw policy conclusion that favors pursuing more open international markets, fewer protectionist measures, effective antitrust policy, and incentive-enhancing industry deregulation. We believe that physical capital accumulation, education, and skill acquisition will necessarily follow through market forces with services from the government (rendered in a way that does not hamper market incentives) so that positive-externality goods are not under-produced.

It is not our intention to address the other paramount issue in economic development in this paper; that is the issue of intra-economy income distribution. However, we would be remiss to pretend that it can be swept under the rug. Our stand is that the economic arrangement that promotes free enterprise should not be cast aside in favor of state protected monopoly rights even if equity is at the top of our agenda. Our wide policy recommendation to poor countries is to stop protecting industries or vested interests at the expense of the general populace. The idea is to have a level playing field, both for firms and workers, using market price mechanism as a principal instrument and necessary aid from a government that is mindful of the correct incentive system. The clubs of inefficient civil servants, state-enterprise employees and other beneficiaries of monopoly rights in general, once whittled away, will make room for an efficient class of better off entrepreneurs and workforce.

Governments in developing countries, particularly the Thai government, and major international agencies involved in economic development (namely the World Bank, IMF, ILO, UN, and BIS) ought to shift their analytical focus from factor accumulation to theories that highlight productivity growth. We are not arguing that factor accumulation plays no role in economic development. However, we believe, after having observed overwhelming supporting evidence, that TFP is more important a factor, and that research has barely begun to quantify the contributions of its determinants to economic growth. The need of the hour is a good theory of TFP.

This paper is structured as follows: Section II details some interesting facts on international difference in living standards from a historical standpoint leading toward our theory on why the rich-poor divide exists, with a focus on Thailand. In Section III, we train our eye toward the role played by macroeconomic policy in long-term growth. We also examine the neoclassical growth-theoretic analysis of the divide, concluding that it is not a good working theory unless it allows TFP to vary at any point in time and vary appropriately for each country. We present evidence from the literature that TFP provides an underlying story of the divide and that we need a working theory of TFP. This working theory involves the ability and incentive of factor suppliers to resist better technology adoption and better work practices associated with currently operating technologies. Section IV outlines the theoretical model and deals with existence and characterization of equilibrium under the two respective arrangements, "monopoly rights" and "free enterprise". Section V gives stylized facts of growth that the model should be able to match and deals with model calibration to Thailand and US's data. Equilibria are then computed and compared, model aggregates analyzed, and TFP comparison made, leading to policy conclusion in Section VI. Details that we deem necessary to the readers who wish to replicate our results are in the Appendix.

Section II: Historical Evidence and Lessons for Today's Thailand

From a historical point of view, the immense international rich-poor divide is a relatively recent economic phenomenon. Before the 1700s-1800s, one could not find serious discrepancies in the standard of living (as measured by per capita income) across major civilizations. Indubitably, there were technological advances that contributed to increases in output per worker-hour before the 1800s. However, any significant rise in income was usually offset by an upsurge in population that brought down average standard of living. Furthermore, famine and natural epidemics played the role of equalizers in those times. In Thailand, modern economic growth, the defining feature of which is *sustained* increase in living standards, occurred only around the middle of the 1900s. The *Malthusian* model of economic development does well to capture these important stylized facts of economic growth prior to the 1800s in the West and pre-1900s in the East, Thailand included. Despite its notable strength, the *Malthusian* model fails miserably as a framework for understanding modern economic growth.

There are doubtless many factors that determine the rate of economic growth in each society. It is well accepted that moving a country onto a superior growth path requires a great deal more effort than any one section of that society can marshal. A perceptive tourist may be able to identify superficially what factors enhance or impede progress in a society, but it behooves growth and development economists to provide a useful framework for analysis or a sensible working theory, in which major factors that determine the state of the economy in the long run are clearly identified.

If one wishes to understand the process of modern economic growth in Thailand, one may find it sensible to begin by considering the following pertinent questions and organize aspects of their candidate answers into a useful set of stylized facts. First and foremost, why did standard of living begin its sustained growth after being relatively stagnant for centuries in Siam? Why did "growth miracles" occur in some countries and not in others with similar starting per capita income levels?[3] Specifically, what fundamental change occurred in Thailand that caused rapid growth in real *per capita* GDP (5.3 per cent per annum) during 1960-1995? What kind of indigenous technological innovation caused this sharp turn of event? Or did Thailand rely on technological adoption with the succor found in a more growth-enhancing economic arrangement?

To help guide us along this path of introspection, we may even ask: Why did the Industrial Revolution, from which sprung sustained economic growth, begin in England and trickle to Continental Europe when in fact historians are in agreement that England lagged the continent in almost all measures of human and physical capital at the time? Max Weber, in his classic exposition *The Protestant Ethic and the Spirit of Capitalism*, was among the first to stress the role of Calvinist work practice and economic organization that distinguishes and propels the societies that adopt that work ethic towards greater prosperity. We wish to take his thesis seriously and examine from a different perspective how appropriate it is to the Thai experience.

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[3] Note that Korea, India, and the Philippines are roughly on a par in terms of per capita income at purchasing power parity prices in 1950 when they embarked on their modern growth paths, but their per capita incomes are multiple times apart today.

The Thai economy had been an agrarian based one. Even though statistics are hard to find or in most cases nonexistent, we know that before 1855, when the Bowring Treaty was signed, per capita output growth rate of what had been the Kingdoms of Ayutthaya and early-Rattanakosin was lower than post-1855. Much like other civilizations of the time, economic growth was based on the use of more land and labor. Sakkriangkrai (1984) suggests that in absence of useable technological breakthroughs and storage technology, durable savings after consumption was limited and per capita output growth prior to 1855 could be as low as zero on average. After the dismantling of the royal monopoly power in international trade, the backbone of the 1855 treaty, the economy was more open with rice, golden teak and tin production steadily on the rise and economic growth became palpable. Nartsupha and Prasartset (1984) documents that the sanction of the use of Mexican currency by the government as a legal means of payment is evidence of the fact that more money was needed to support the expanding economy. Other signs of economic growth are the increasing number of rice mills and sawmills. Nevertheless, labor productivity was still low and the rate of economic growth remained unimpressive, as production techniques were rudimentary and technical progress was minimal.

Along the same line with Mokyr (1990) in his explanation of why China was unable to maintain the lead in scientific innovation and standard of living after the expulsion of the Mongolian occupiers in AD1400, Aiemtham (1984) presents a strong case that the Sakdina (Feudal) socio-economic arrangement in Siam abounded with evidence of vested interests resisting technological progress, be it from innovation or adoption, and that the interest of the entire populace was subservient to those of a few. When most of the surplus derived on the farm had to be transferred to the aristocrats, and social penetration was few and far between, little incentive existed for improvement in their production techniques. Since the majority of productive workforce, the *phrai* (peons), had to be on service up to six months a year, trading and other businesses were not in their hand, creating the vacuum that had to be filled by Chinese immigrants. As a result there was no profitable motive for invention or adoption of technology on a significant scale.

To see why Thailand lagged behind Western society after the Industrial Revolution, we explore Mokyr's (1990) thesis on why China in AD1800 was relatively poorer than it was in AD1300. Chinese leaders after AD1400, the Ming and Qing emperors, were more absolute and autocratic than their predecessors in the Song dynasty. Mokyr (1990) provides evidence as to how the non-usage of available better technologies in mining, transportation, soybean oil pressing and silk reeling was the product of resistance by powerful workers' guilds. At the same time, the Chinese bureaucrats became a major force in preserving the status quo, and not even the most powerful emperors could implement progressive policies, thereby stifling the scientific dynamism typically associated with technological progress. Imperial China was insulated from effective challenges, and its system crumbled when seriously faced with one. In contrast, technological change in Europe was a matter of private enterprise; the role of the rulers was secondary and passive. Moreover, whenever a European state chose to take an actively hostile attitude toward innovation, it had to face the consequences in terms of relative status in the economic and political hierarchy. In the long run, backward-looking societies succumbed in the competition for wealth and power in Europe.

Specific cross-country evidence exists in support of our thesis. For example, Clark (1987) and Wolcott (1994) argue that work practices adopted by Indian and Japanese textile mills' laborers at the turn of the 20th century exemplify the correlations between productivity and the ability and incentive of factor suppliers to resist the efficient use of an existing technology and adoption of superior ones. Over the period 1920-1938, output-per-worker at an average Indian textile mill increased by 40 per cent compared with 120 per cent at an average Japanese mill despite similarities in the quality of looms, workers' education and nutrition in their diets. The former argues that culture is responsible for this productivity difference, but the latter suggests an explanation that is more economic in nature. Wolcott (1994) points out that the Indian textile workers were adult male who expected to keep their job for a lifetime while their Japanese counterparts were unschooled girls who expected to be married within a few years into their job and quit. The textile market was characterized by rather inelastic demand, and so workers associated the implementation of better work practices with the loss of jobs.[4] Workers in India enjoyed state backing and textile firms were not threatened by foreign competition. On the contrary, state protection was foreign to Japanese textile workers. Strikes were effectively quelled and workers quickly replaced. Wolcott (1994) suggests that these differences in productivity growth are closely associated with labor's ability to resist employers' attempt to improve work practices.

Although Thai law may not be explicitly in support of workers' rights to unionize, lifetime employment is a virtual implicit guarantee in certain sectors, almost a social contract of sort. We do not wish to place too much emphasis on the rights to unionize as an impediment to productivity growth *per se* since we do not believe that it is necessarily true. Coalitions of factor suppliers may be strong and able to block better work practices in rich countries, but they do not do so because their very existence would be in jeopardy in the face of stiff competition from abroad. In fact, we wish to stress that the actions to deter firms in an industry from improving work practices are immaterial unless the state also shelters the industry from outside competition. Entry by foreign and domestic firms can be made prohibitively costly through various means imposed by the state. These may come in the form of regulatory, tariff, tax and quota regimes or through other informal means.

Poor countries are infamous for sheltering monopolies, erecting competition-asphyxiating trade barriers, and other barriers to adoption of technology usually garbed in nationalist economic policy. In all fairness, richer countries have a set of technology denial regimes that lessen the speed of catching up by those on the other end of the divide. However, these regimes are mainly pervasive in the sensitive areas of defense and national security, most of which are not designed to scuttle the technologies that are beneficial both to people in poor countries and their own corporations and workers. In contrast, protectionist attitude in agricultural policy on the part of rich countries only serves their own vested interests to the detriment of the majority of their people and poor countries.

Current industry-specific evidences for Thailand in support of our view can be found in McKinsey Report (2001), *Prosperity through Productivity*. The report documented organizational and technological deficiencies in the cement, chicken processing, beer, retail, retail banking, and telecommunication industries. Limited outside competition is

[4] If supply were to increase, output price *and* revenue could be expected to fall precipitously as a result of the inelastic demand, prompting profit-maximizing firms to lower cost by firing workers.

cited in most industries, and excess labor and limited use of machines in telecom and retail banking sectors are highlighted. The rest of the reported deficiencies, e.g. "complex workflow with multiple authorization," occur to serve the purpose of this labor excess shielded by insufficient competitive pressure.

It is not suggested here that factor accumulation plays no role in driving economic growth. Rather, growth in physical capital stock induced by productivity should be attributed to productivity. Higher TFP raises marginal product of capital, which in turn stimulates investment and capital accumulation that would not occur otherwise.

A simple calculation using TFP growth rates for Thailand, ranging from 1.3 to 2.7 per cent per annum, indicates that TFP growth accounts for 38 to 69 per cent of real GDP *per worker* growth. In light of these findings, Thailand's past growth experience should not be understood in terms of the pessimistic "neoclassical revivalist" view as heralded by Young (1994). Rather, more energy should be devoted to understanding how TFP has come about, and how to foster its growth for future prosperity. This is why understanding what tremendous prosperity has been brought about through the change in arrangements from the Sakdina era to that found post-1960s will shed light on what needs to be done to reform the current arrangement going forward.

Neoclassical growth theory cannot explain differences in cross-country per capita incomes precisely because it does not allow TFP to vary across countries at a point in time and to vary over time in a theoretically sensible way for each country. A good working theory of TFP is called for.

We proceed now to identify a successful candidate theory that may go a long way to explain these long-term facts in the context of growth theory.

Section III: Macroeconomic Stability, Economic Arrangements and TFP Growth

One obvious significant factor that may explain income differences between rich and poor countries is different endowments of natural resources, from which we wish to abstract away in our exposition. The reason for this abstraction is because only a small number of countries are rich in per-capita oil endowments and they do not have large populations. As a result, a successful theory of international income differences should not place too much emphasis on this aspect. Besides, there are a number of countries, if we consider only those with a relatively stable governing regime, that are immensely rich in natural resources but the majority of whose populace is dismally poor. One needs to look no further for examples than the cases of Nigeria and Mobutu's Zaire, the erstwhile incarnation of the current Democratic Republic of the Congo, to concede this point.

Another important *prima facie* determinant of income differences between Thailand and the US is differences in capital per worker. Higher capital per worker in the US (by a factor of 6 in 1990, and 18 in 1965) is an additional underlying reason why the typical American worker is more productive than the Thai one. However, we believe that the higher level of capital per worker itself cannot be taken as exogenous to our understanding of the rich-poor divide; it needs to be explained. We conjecture that capital per worker is high in the US precisely because its TFP is high. TFP not only

determines labor productivity directly, but it also does so indirectly through the effect of capital per worker.

Before moving on to our candidate theory, we wish to summarize recent significant findings made in the field of economic growth and development. Two such findings toward which economists have developed a more consonant attitude in the last decade of empirical research are the following: (1) Macroeconomic stability is necessary and provides for conducive but not sufficient conditions for the bringing about of long-term growth; that is, it is neutral vis-à-vis the rate of growth. And, (2) Differences in physical and human capital stocks alone *cannot* significantly account for international income differences. That is, factor accumulation cannot account for most of the growth and income differences across countries.

A natural sequitur can be stated thus: If we define TFP to be the residual "inputs" over and beyond physical and intangible capital, then within the framework of neoclassical growth theory, TFP growth accounting primarily indicates that these residuals may explain the bulk of the discrepancies in world per capita incomes. In short, the story is the difference in levels and growth of total factor productivity. This finding has been demonstrated theoretically, empirically, and via growth accounting, as documented by Prescott (1997), Klenow and Rodriguez-Clare (1997), Easterly and Levine (2000), Klenow (2001), and Hendricks (2002), among others.

Section III.1: Macroeconomic Stability and Long-Term Growth: "Necessary" but Insufficient

We first present our result on the importance of macroeconomic stability in providing an environment in which economic growth may take place, and the neutrality of its effects on the rate of *long-term* growth.

At the moment, a collective body of research suggests that macroeconomic stability is conducive to, but is *not* a sufficient condition for, sustainable economic growth of a degree that may narrow the rich-poor divide.[5] Countries that grow faster on average in the long run often enjoy macroeconomic stability, but countries with macroeconomic stability may grow more slowly. Fischer (1993), for instance, points out that African countries in the Franc zone had macroeconomic stability but did not achieve higher growth rates on average than other African countries.

A stable macroeconomic framework is generally described as one with low inflation, "appropriate" real interest rates, "stable and sustainable" fiscal policy, "competitive and sustainable" real exchange rate, as well as "viable" balance of payments. This description is admittedly vague. To subject it to serious econometric enquiry requires additional refinements. Many studies on the issues resort to identifying the relationship between indicators of macroeconomic policy and economic growth (see, for example, De Long and Summers (1992), Fischer (1993), Sarel (1995), Khan and Senhadji (2000), Milesi-Ferretti and Razin (1998)).

Without loss of generality, the literature on inflation, money, deficits and debt, abounded with evidences in support of the following working hypothesis: macroeconomic stability is characterized by low inflation.

[5] See, for examples, De Long and Summers (1992), Fischer (1993), Gallego and Loayza (2001).

Relationship between inflation and growth has been explored in many studies. As more data become available, and measuring techniques more refined, inflation is found to be negatively related to output growth, once a certain threshold is breached (see, for example, Sarel (1995), Khan and Senhadji (2000)). If inflation is below the threshold, the negative relationship between inflation and growth becomes less pronounced; it can even turn positive. High inflation is generally thought to affect growth through uncertainty. Variability of inflation is often used as a proxy for that uncertainty. Various studies find inflation variability to be negatively associated with growth. This is consistent with the findings that high inflation can be detrimental to long-term growth, as high inflation is usually variable inflation.[6] Once inflation is below the threshold, varying it does not guarantee changes in long run growth rates. The relationship between growth and inflation rate below the threshold is indeed quite weak.

High inflation is generally linked to high deficits and public debt. If budget deficit is too high, the government may resort to printing money to finance the deficit, leading to high inflation. Stable and sustainable fiscal policy implies both non-excessive government borrowings and manageable public debt. This variable cannot be entirely divorced from inflation in the long run. As the optimal levels of public deficits and debt can vary from country to country in response to shocks, studies on the effect of fiscal policy on growth use common indicators such as the ratio of fiscal surplus or deficit to GDP in their estimation.

Fischer (1993) finds that an increase in a budget surplus by 1 percent of GDP is linked to the growth rate that is 0.23 percent larger. We believe that the magnitude of the effect of fiscal surplus on growth rate reported by Fischer (1993) is too large. We are convinced that such conclusion is due to the fact that Fischer's (1993) panel regressions estimate *annual* GDP growth on *annual* values of macroeconomic indicators. The effect of reverse causality in such panel regressions could be severe.[7] Running panel regressions using 5-year average values, Sarel (1995) finds a negative relationship between the ratio of government expenditures to GDP and growth, but with a much smaller magnitude. A country whose government overspends its current income by 1 percent of GDP is found to grow by 0.07 percent more *slowly*. Over a longer time horizon, the obtained relationship between fiscal policy and growth is likely to reflect the fundamental policy stance, rather than short-term responses to shocks. Consequently, using 5-year averages in the estimation, as Sarel (1995) does, is likely to mitigate the problem of reverse causality.

Theoretically, unsustainable current account positions can lead to current account reversals that possibly affect *short-term* output growth. Such reversals usually occur when countries' solvencies are in question, and creditors refuse to extend further credits, limiting their ability to finance consumption and investment from outside borrowings. The current account could reverse from deficit to surplus. Milesi-Ferretti and Razin (1998), however, finds no systematic association between current account reversals and a growth slowdown. Indeed, in more open economies, where real exchange rate

[6] High inflation, in particular explosive inflation (hyperinflation, for example), disrupts basic economic activities and is obviously detrimental to growth.

[7] A high-growth country can run a budget surplus as tax revenues are likely to be ample and the government is in no urgency to overspend. The government that faces an economic downturn, however, may resort to fiscal deficits to counter it, and tax revenues are more likely to be short in trying times.

appreciated less prior to the reversal, growth tends to be faster after the shock occurs. The findings by Milesi-Ferretti and Razi (1998) support many cases where, over a long period, a country that finances its domestic demand through foreign borrowings need not experience lower growth than otherwise. In the *long run*, current account positions need not affect output growth.[8]

"Conducive but Not Sufficient": A Fresh Look at Macroeconomic Stability

This section of the paper takes a fresh look at the effects of inflation, fiscal, and current account positions on *long-term* output growth.[9] This study uses panel regressions on the International Financial Statistics (IFS) data from 1961 to 1999. The estimations are done using decade average values over four decades starting in 1961, although the 1990's contain only 1991-1999 data.[10] The maximum number of valid observations is 293 with 96 countries present.[11] The study is performed along the line of Fischer (1993), in which output growth is regressed separately on each of the macroeconomic policy indicator and a constant. The reason for not including other variables typically used in growth regressions (such as investment or initial income, see Barro (1991)) is that we wish to evaluate the total effects of macroeconomic policy on growth rather than its direct and indirect effects via other such variables.

This study differs from previous work in the choice of the macroeconomic variables and the way long-term growth is specified in the regressions.[12] Furthermore, we evaluate the effect of macroeconomic indicators on *decade* average output growth, so as to avoid the effect of business cycle booms and busts and focus more on a "longer term" implication.[13] Unlike Fischer (1993), the effects of inflation on output growth in this paper are evaluated using threshold effects along the line of Sarel (1995).

Table 1 (Equations (1) to (4)) reports the panel regression results. Note that in evaluating the effects of inflation and fiscal position on output growth (Equations (1) to (3)), terms-of-trade change is included as an extra variable to proxy for supply shocks and control for possible endogeneity problems. Supply shocks, a prime example of which is a terms-of-trade shock prevalent in developing economies, can lower output growth and

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[8] According to Milesi-Ferretti and Razin (1998), when current account positions are unsustainable and reversals occur, even short-run output growth is not systematically affected.

[9] Fiscal sustainability and current account sustainability are themes of 2 research pieces presented at the 2002 Bank of Thailand (BOT) Annual Symposium, while inflation targeting is currently Thailand's monetary policy framework. Naturally, these issues are of concern to BOT staff. Our studies focus on their effects on long-term growth.

[10] If we included data for 2000, we would lose a significant amount of observations, since many countries have so far not reported their 2000 statistics.

[11] For this study, the maximum number of valid observations is used in regressing output growth on inflation.

[12] Fischer (1993) evaluates the effects of inflation and government budget position on output growth, but not the effect of current account position on growth.

[13] Other panel studies on a similar theme are often done on short or medium term. For examples, Sarel (1995) studies the effects of inflation using 5-year average growth and Milesi-Ferretti and Razin (1998) studies the effects of current account reversals 3 years before and after the events. Fischer (1993) studies effects of macroeconomic factors on long-term growth, using both cross-section and panel regressions for 1961-1988 data. Panel regressions in Fischer (1993), however, are estimated using year-on-year growth rates.

at the same time raise inflation. Also, when experiencing a supply shock, a government may choose to increase its spending to counter a possible output slowdown.

According to Equation (1), below a threshold of 7 per cent, inflation is positively related to growth, with a slight magnitude.[14] Once inflation rises beyond 7 per cent, it has an important negative relationship with output growth.[15] Equation (2) shows that when the threshold is raised to 11 per cent, the negative effects of inflation on growth remain large. If we consider low inflation to be a key characterization of macroeconomic stability as posited earlier, then our regression results suggest that macroeconomic stability may be thought of as necessary but not sufficient for growth. A country that allows inflation to spiral out of control is likely to have its output growth slowed down. However, a country where the government manages to keep inflation low does not necessarily grow *noticeably* faster in the long run. In fact, most countries with low inflation are already rich and could be close to experiencing their low steady state growth rates.

Our results confirm Sarel (1995) and Kahn and Senhadji (2000) who find inflation below a threshold level to have small but marginal relationship with output growth. Our results indicate the following policy implication: The temptation to raise output growth by raising inflation when inflation is positive and below threshold should be checked, as there is no guarantee that inflation will not spiral out of control and the miniscule positive effect on growth is not worth the risk from the damage caused once the rough threshold is breached.

Similar to Fischer (1993), fiscal surplus is found to have a positive relationship with output growth (see Equation (3)). However, the magnitude of the coefficient is so small that the government needs to run an impossibly large fiscal surplus in order to noticeably affect long-run growth. To illustrate a point, budget surplus would need to rise by 100 percent of GDP in order to raise long run output growth by 0.02 percent. The result here possibly indicates a form of Ricardian Equivalence where budget deficit or surplus should not affect real activity in the long run. The result here also agrees with Sarel (1995).

Equation (4) indicates that a country running a current account surplus is expected to grow faster albeit "unnoticeably". Similar to the case of fiscal budget, the current account coefficient is so miniscule that in order to noticeably affect output growth, an increase in current account surplus needs to be impossibly large. The results here accord well with Milesi-Ferretti and Razin (1998).

The relationship between long–run growth and inflation beyond the thresholds is robust to addition of typical growth regression variables, as illustrated in Table 2; although inflation below the thresholds is shown not to have any statistically significant relationship with growth in this case.

Statistically, the results from Table 1 suggest that maintaining macroeconomic stability, especially in terms of keeping inflation low is necessary for growth. Otherwise long-term

[14] Khan and Senhadji (2000) finds inflation threshold for a developing country to be between 7 – 11 per cent per annum, while Sarel (1995) finds inflation threshold to be at 8 per cent.

[15] Beyond the threshold, if we double the inflation rate, say from 15 to 30 per cent, output growth will decline by roughly 1.7 per cent per annum.

output growth might be adversely affected. However, macroeconomic stability as characterized by low inflation is statistically neutral to long-term growth rates. Improving long-term growth rates requires more from an economy than a government that concerns itself with proper management of macroeconomic policy.

Table 1

Effects of Relevant Macroeconomic Policy Indicators on Growth

Dependent variable: *GDPx*

Equation	Constant	$\log(\pi)$	Threshold π^*	$\frac{\text{BDS}}{\text{GDP}} \cdot 100$	$\frac{\text{CA}}{\text{GDP}} \cdot 100$	ΔTOT
(1)	0.0145	0.0022	-0.0172			0.002
Obs = 219	(16.53)	(5.48)	(-11.73)			(1.51)
(2)	0.0123	0.0015	-0.0209			0.001
Obs.=219	(20.68)	(5.14)	(-8.99)			(1.002)
(3)	0.0097			0.0002		0.002
Obs.=163	(31.65)			(3.00)		(0.84)
(4)	0.0075				2.80E-09	
Obs.=193	(69.02)				(4.14)	

Notes:

a) Regressions are done using Generalized Least Squares (GLS)

b) The t-statistics are in parentheses.

c) *GDPx* = decade average growth in real GDP per capita (t, t +10)

$= \frac{\log(rgdp_{t+10} / rgdp_t)}{10}$, where rgdp = real GDP per capita.

d) $\pi = \frac{\log(P_{t+10} / P_t)}{10}$

e) π^* = inflation threshold,
= 7 percent per annum in Equation (1),
= 11 percent per annum in Equation (2).

f) Threshold π^* = Measure that captures beyond-threshold inflation

$= D^{\pi^+} \cdot [\log(\pi) - \log(\pi^*)]$,

where $D^{\pi*}$ = 0 if $\log(\pi) < \log(\pi^*)$, and $D^{\pi*}$ = 1 if $\log(\pi) > \log(\pi^*)$

g) $\frac{\text{BDS}}{\text{GDP}}$ = decade average of the ratio of fiscal surplus (+) or deficit (-) to GDP

h) $\frac{\text{CA}}{\text{GDP}}$ = decade average of the ratio of current account surplus (+) or deficit (-) to GDP

i) ΔTOT = average changes in terms of trade over a decade (t, t + 10)
= log (terms of trade $_{t+10}$/ terms of trade $_t$)

Table 2

Effects of Different Inflation Thresholds and Other Variables on Growth

Dependent Variable: *GDPx*

Independent Variables	Equation 1 π^* = 11 percent	Equation 2 π^* = 9 percent	Equation 3 π^* = 7 percent
Constant	0.0083 (2.88)	0.0097 (2.92)	0.0118 (2.87)
log(π)	-0.0003 (-0.21)	0.0006 (0.31)	0.0017 (0.72)
$D^{\pi^+} \cdot [\log(\pi) - \log(\pi^*)]$	-0.0133 (-2.76)	-0.0133 (-3.12)	-0.0131 (-3.32)
$\frac{BDS}{GDP} \cdot 100$	0.0002 (2.88)	0.0001 (2.11)	9.65E-05 (1.47)
$\frac{CA}{GDP} \cdot 100$	-1.95E-05 (-0.26)	-9.32E-06 (-0.13)	2.15E-05 (0.35)
ΔTOT	0.0032 (0.76)	0.0027 (0.63)	0.0017 (0.42)
$\log(y_{61})$[16]	-7.98E-05 (-0.21)	-4.55E-05 (-0.12)	1.46E-05 (0.04)
Industrial Country	0.0022 (3.01)	0.0022 (2.84)	0.0018 (2.18)
Number of Observations	70	70	70

[16] Log of initial value of real GDP per capita, in this case, 1961 GDP.

Section III.2: Economic Arrangements, Long-Term Growth and its Determinants

Research has hardly begun to identify the mechanism by which TFP may be associated with economic arrangements and quantify the contributions of its determinants to economic growth. To make a methodical start to our approach of distilling important underlying factors governing the process of economic development, it is useful to start by determining which factors are not part of TFP. After ruling out several factors, we can be more certain to find a significant determinant of TFP.[17]

Prescott (1997) evaluates neoclassical growth theory as a theory of international income differences and, in concurrence with Klenow and Rodriguez-Clare (1997), Easterly and Levine (2000) and Klenow (2001), argues against the findings of Barro (1991) and Mankiw, Romer, and Weil (1992), which suggest that differences in per-capita income can be accounted for by differences in investment in training.[18] In contrast to the latter two papers' affirmative decision in favor of an extended version of the neoclassical growth model, Prescott (1997) finds that neoclassical growth theory does not make for a successful theory of economic development, even after the concept of capital is extended to include human and other forms of intangible capital. The failure of this theory arises from the simple fact that differences in savings rates cannot account for the differences in per capita incomes unless investment in intangible capital is inconceivably large.

For the growth model to be a theory of international income differences, differences in capital stock per worker should account for the discrepancies in output per worker because technology is common across countries in models of this class. It must be noted that measuring capital stock is no straightforward task. Defining it is already conceptually problematic. Relative prices of investment goods in terms of consumption goods are not constant across countries; in fact, they are substantially higher in poor countries. Some researchers may conclude that capital-output ratios are smaller in poor countries as a result, and therefore, smaller capital-output ratio is the cause for smaller output-per-worker in poor countries; that mis-measured capital is the story.

The best available data on capital stocks today, which are designed for cross-country comparison, are constructed by Summers and Heston (1988), whose procedures include utilizing a concept of purchasing power parity to measure stocks of capital across countries in terms of a common set of international prices.[19] In Prescott's (1997) exercise, adding to the Summers and Heston's physical capital stock are previously missing capital stocks, unreported in the national accounts. The missing capital consists of human and other forms of intangible capital viz. investment in training (wages foregone and training costs), investment in R&D, firm-specific learning-by-doing, and

[17] Several economists have conducted detailed growth accounting exercises for one or a few countries. In these exercises, the authors use disaggregated data on capital, labor, human capital, and capital shares of income. A comprehensive piece of research work on Thailand's productivity accounting that ought to be mentioned at this point is Tinakorn and Sussangkarn (1998).

[18] The bedrock of the neoclassical growth theory is the constant returns to scale neoclassical production function. Advantages of this construct abound: it captures well the balanced growth that has been an empirical regularity in the US economy for the past two centuries and it is a theory both of the income and the product sides of the national income accounts, as shall be discussed further below.

[19] For comprehensive details on their procedure, see Kravis et al (1982). We also utilize the Geary-Khamis PPP concept used by Summers and Heston (1988) in the comparison of outcomes from the numerical solutions below.

organization capital – the upper bound of which is roughly estimated to be $1/3$ of GDP in total.

It is then demonstrated that even if a human capital production sector in the style of Lucas (1988) is incorporated into the neoclassical growth model, the calibrated model still fails to do the job of explaining international income differences. The only case where differences in time allocated to enhancing human capital can lead to large discrepancies in long-run per capita incomes is when diminishing returns to human capital investment are miniscule, so miniscule that it would imply an inconceivably large amount of time allocated to enhancing human capital.

Armed with these evidences, we are more confident that the bulk of the discrepancies in world per capita incomes must be explained by differences in TFPs.

Other research works, namely Christensen, Cummings and Jorgenson (1980), Elias (1990), and Young (1994) collectively show that the fractions of output growth accounted for by TFP growth vary from 50 per cent for OECD countries to 30 per cent for Latin American and Asian countries, save for Singapore. However, Klenow and Rodriguez-Clare (1997), through newly constructed measures of human capital across countries from the returns to schooling and experience gathered from the labor literature, shows that even these numbers can be seriously *under*-estimated.[20]

The aforementioned works, save for Klenow and Rodriguez-Clare (1997), focus on the role of TFP growth in accounting for output growth, and not in examination of growth of output *per worker*, which is the relevant factor determining per capita output -- a widely accepted proxy for living standards in an economy that can be found in the data. Like Mankiw, Romer, and Weil (1992), Klenow and Rodriguez-Clare (1997) examines the following derivation of the neoclassical production function:[21]

$$\frac{Y}{L} = A \cdot \left(\frac{K}{Y}\right)^{\frac{\alpha}{1-\alpha-\beta}} \left(\frac{H}{Y}\right)^{\frac{\beta}{1-\alpha-\beta}} = A \cdot Z$$

In this measure, the determination of the number of workers to be used as proxy for labor input in each country is left aside.[22] Moreover, a composite of the two capital intensities, Z, is segregated completely from TFP, or A. This simple construct gives TFP its due credit for variations in K and H brought upon by differences in TFP, while the contributions of K and H variations not induced by TFP are captured by variations in Z.

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[20] This approach postulates a human-capital production function and constructs human-capital stocks on the basis of perpetual inventory method (PIM).

[21] This equation is rearranged from: $Y = K^{\alpha} H^{\beta} (AL)^{1-\alpha-\beta}$, where $Y, K, H, L,$ and A are output, physical capital stock, human capital stock, labor input and TFP, respectively. The production function is Cobb-Douglas (with labor-augmenting technology) with α and β as shares of the respective inputs.

[22] Klenow and Rodriguez-Clare (1997) concurs with a well-documented fact that there is a great deal of variation in the average number of hours worked in the market (as opposed to in home production) across countries. This makes the number of workers a poor measure of labor input, and contributes to higher measured TFP in rich countries, since market hours per worker is much higher in developed markets of the rich countries.

Klenow and Rodriguez-Clare (1997) shows that in all of the East Asian miracles, TFP, and not factor accumulation, plays a dominant role in accounting for growth of output per worker. As a result, their interpretation of the growth miracle in Asia differs markedly from that of Young (1994). Using their average TFP growth for Thailand of 2.7 per cent per annum, we find that TFP growth accounts for 69 per cent of growth of real GDP per worker during 1960-85, which averages 3.9 per cent when measured with Summers and Heston's purchasing power parity prices – a measurement consistent with the measured TFP growth in their work.[23]

Our argument is not based on a false concept that factor accumulation plays no role in driving economic growth. Rather, we believe that it is TFP that drives growth both directly and through capital intensities. As suggested earlier in the introduction, higher TFP raises marginal product of capital, which in turn stimulates investment and capital accumulation that would not occur otherwise.

Levels accounting for 64 countries by Easterly and Levine (2000) demonstrates that TFP accounts for the bulk of cross-country disparities in incomes per capita, using Summers and Heston's purchasing power parity prices. Furthermore, when estimates of human capital accumulation are incorporated into growth accounting exercises, the findings are not significantly altered from those that do not incorporate human capital. That is, TFP growth still, on average, accounts for more than half of output-per-worker growth.

Two more recent pieces of evidence pointing toward an identical sequitur are Jasso, Rosenzweig, and Smith (2000) and Hendricks (2002). The former compares earnings of US immigrants with those in their country of origin. They find that the average immigrant earns 2.2 times as much in the US as in their country of origin, or equivalently, 75 per cent as large as the earnings gap between the average US worker and her counterpart in the source countries. Therefore, 75 per cent of the gap between US and source country earnings cannot be explained by general human capital. If physical capital per worker is responsible for 25 per cent of the gap, as suggested by Easterly and Levine (2000), then 50 per cent is left unaccounted for – or rather it may be attributable to TFP. The latter compares immigrant workers from different countries in the same labor market to estimate their human-capital endowments, thereby circumventing the need to posit a human-capital production function like Klenow and Rodriguez-Clare (1997). These estimates are then used to show that human and physical capital account for less than half of the output gap relative to the US for countries below 40 per cent of US output per worker.

With regard to the issue of causality, the literature of the past decade is arrayed with evidences suggesting that physical and human capital accumulation may not secure accelerating growth. To name a few, Blomstrom, Lipsey, and Zejan (1996) argues that the direction of causality tends to run from output growth to investment; Carroll and Weil (1994) shows that output growth Granger-causes savings, and not *vice versa*; and most important, Bils and Klenow (1996) tells a parallel story of human capital and

[23] If we use 1.3, which is Thailand's average TFP growth rate during 1980-95 given in Table 8 of Tinakorn and Sussankarn (1998), then TFP growth accounts for 38 per cent of growth of real GDP per worker (adjusted for labor quality) during the period, using the same source's average GDP growth of 8.1 per cent and labor growth at 4.7 per cent. For the calculation of growth in quality-adjusted labor for Thailand, we use data from Appendix Table 12 in Tinakorn and Sussangkarn (1998). The magnitude of this contribution, at 38 per cent [1.3/(8.1-4.7)], is still very much sizable.

growth – that is, the direction of causality seems to run from growth to human capital, and not conversely.

These findings lead us to believe that factors other than capital accumulation may account for differences in worker productivities, and *ipso facto* differences in per capita incomes, between Thailand and Western industrialized countries. Consequently, Thailand's past growth experience should not be viewed in the pessimistic "neoclassical revivalist" light. Rather, more energy should be devoted to understanding what brings about TFP and how to enhance it.

Thus far in this paper, the term TFP has not been given a theoretical construct beyond a status of "residual" within the growth accounting framework. Several strands of economic literature have attempted to give content to the TFP concept: TFP differences are postulated to arise from human capital externalities, access to specialized or high-quality capital or intermediate goods, degree of competition, disembodied technology, or simply measurement error. Grossman and Helpman (1990), Romer (1990), Aghion and Howitt (1992, 1998) focus on technology, which is how to combine inputs into goods and services. Romer (1986) and Lucas (1988) are a few examples of those that focus on externalities – technological spillovers, economies of scale, and a variety of complementarities – in elucidating how TFP can account for differences in the levels or growth rates of real GDP per worker.

Prescott (1997) has also focused on technology, but with a different philosophy. He reasons that different policy arrangements that societies employ, specifically those arrangements that predispose or regulate economic agents' ability and incentive to resist adoption of new technologies and the efficient use of currently operating technologies, are the root cause of cross-country differences in TFPs and incomes per capita.

The evidences provided by this body of research suggest that Thailand should place more emphasis on *economic arrangements* that encourage TFP growth than on capital accumulation per se. The very economic arrangement is the one that allows market incentives to drive innovation and adoption of better technology, which we call the "free enterprise" arrangement.

Section IV: The Theoretical Model

In this section, we draw heavily from and utilize the theoretical model of Parente and Prescott (1997) and calibrate it to fit Thai and US empirical facts. After the calibration exercise is performed, the model is ready for a study of the Thai economy in the long run, holding other relevant variables constant while varying economic arrangements from "monopoly rights" to "free enterprise". We study the model's long-term prediction and draw conclusions on relevant model aggregates and TFP differences between the two arrangements.

Model's Environment:

The model economy consists of 3 sectors, namely those of the household, industry, and agriculture (or farm). In any given period, a household has an option to be one of the three: a worker in the farm sector, a worker in the industrial sector, or an entrepreneur in the industrial sector who adopts a technology to produce goods.

Let $t \in \{1,2,3,...\}$ denote the time period in this model economy, and $i \in [0,1]$ denote the type of industrial goods produced. The *household sector* consists of a measure N of infinitely lived atomless households. At every t, each household is endowed with one unit of labor services and one unit of land, from which one unit of land services is provided. For simplicity, but without loss of generality, households cannot sell their land.[24] At every t, each household values only agricultural goods, a_t, and differentiated (industrial) goods, x_{it}. Households do not value leisure. A household's preference is represented by the following *strictly concave* utility function:[25]

$$U(a_t, x_{it}) = \sum_{t=0}^{\infty} \beta^t \left\{ \left[\int_0^1 (x_{it})^{\eta} di + \mu \cdot (a_t)^{\eta} \right]^{\frac{\theta}{\eta}} - 1 \right\} \Big/ \theta, \qquad (1)$$

where $\beta \in (0,1)$ is the subjective discount parameter measuring the household's degree of time preference; $\mu > 0$ is the weight parameter assigned to agricultural goods in the utility function; $\eta < 0$; and $\theta < 1$. The assumption $\eta < 0$ is made to ensure that household demand for the i^{th} differentiated industrial commodity is price inelastic. It is made to simplify our analysis, the outcome of which does not change absent this assumption. Besides, it mimics Wolcott's (1994) observation re demand for textile products in India and Japan that we mentioned earlier.

There are three technologies associated with the production process in the *industrial sector*. Each of these technologies is constant returns to scale and has only one type of input -- labor services.[26] There is no physical capital in the model. Let $k \in \{0,1,2\}$ denote a choice of technology an industrial firm adopts for producing the i^{th} industrial (differentiated) good. The technological constraint for each differentiated good i at any given time t, or equivalently the industrial production function, $G: \Re_+ \to \Re_+$, is defined as follows:

$$X_{it} \leq G(N_{it}) = \pi_k N_{it}, \qquad (2)$$

where N_{it} is the period-t labor input used for producing good i and X_{it} is the period-t output of good i, and $\pi_0 < \pi_1 < \pi_2$. A technology with parameter π_2 uses the least amount of labor input requirements per unit of output; therefore, it is the most efficient technology available.

An entrepreneurial household, forming an industrial firm, *can* adopt any of the three technologies without having to incur any firm-specific investment. There is no need to

[24] The market for land is not shut down as this assumption is not binding and is made only to simplify the exposition.

[25] The use of an integral over the various types of goods in consumer preferences, signifying benefits from variety, originates from Spence (1976). The current use owes to Dixit and Stiglitz's (1977) refinement of the original idea.

[26] Within this construct, there is no distinction between the terms "technology" and "firm". They are one and the same under constant returns to scale and zero profit where firm size does not matter in equilibrium.

assume costly firm-specific investments in order to show that the monopolistic arrangement can result in the failure to adopt the π_2 technology and the inefficient operation of the inferior π_1 technology.

In the *farm sector*, there is a constant returns to scale, nested CES production function for producing agricultural goods in which the mix of the intermediate goods produced in the industrial sector is treated as a substitute for the composite labor-land input:[27]

$$A_t = \Im\left(X_{a,it}, N_{a,t}, L_{a,t}\right) = \left[\psi \cdot \left(\int_0^1 \left(X_{a,it}\right)^{\sigma} di\right)^{\rho/\sigma} + (1-\psi)\cdot\left(N_{a,t}^{\alpha}\cdot L_{a,t}^{1-\alpha}\right)^{\rho}\right]^{1/\rho}, \quad (3)$$

where $\psi, \alpha, \rho \in (0,1)$, $\sigma < 0$; both ψ and α are share parameters;[28] ρ determines the degree of substitutability of the inputs;[29] $X_{a,it}$ denotes the period-t differentiated good input of type i, $N_{a,it}$ denotes the period-t input of labor services, and $L_{a,it}$ denotes the period-t input of land services. The assumption $\sigma < 0$ is made, parallel to the earlier assumption on η, to ensure that the farm sector demand for each differentiated input is price inelastic. These assumptions enable us to be certain that whenever an industry has a monopolistic arrangement, the equilibrium price will be the highest price that deters entry.

"Monopoly Rights" Arrangement and its Equilibrium

Our research attempts to utilize a model that mimics the state of the real world in the case of Thailand and several other developing countries. Even though there may be several means by which *de facto* monopoly rights may come about -- be they through regulations, other forms of state protection or social contract, or nationalistic fervor in support of domestic state-sanctioned labor unions and enterprises against privatization attempts – the model's monopoly power is effected through the ability of worker coalitions to undertake strategic actions against entering new firms. In order for new firms employing the π_2 technology to enter the market in which such a coalition exists, it has to overcome the resistance associated with the protection of these monopoly rights.

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[27] In this production function, there is diminishing marginal productivity of each input and constant returns to scale in all inputs together. Equivalent to this setting, the additively separable specification by Stiglitz ensures that the marginal product of each intermediate (differentiated) input i is unaffected by the quantity employed of intermediate input j. That is, each intermediate input is neither a direct substitute for nor a direct complement to another. See Barro and Sala-i-Martin (1995), pp. 213-215, for more on modeling a continuum of types of specialized intermediate goods.

[28] The former partially determines, from the point of view of firms in this sector, the share of expenditure on intermediate (differentiated) goods in total expenditures comprising those of intermediate goods and the labor-land composite inputs. The latter is, by virtue of Cobb-Douglas production function (i.e. CES where the elasticity of substitution between two inputs is unity), the share of land rental income in total of land rental and farm wage incomes.

[29] Since $0 < \rho < 1$, the degree of substitutability is between that found in the case of Cobb-Douglas (unit elasticity of substitution, i.e. $\rho = 0$) and perfect substitution (infinite elasticity of substitution, i.e. $\rho = 1$).

The agricultural and household production sectors are perfectly competitive. Moreover, any individual can avail himself of the π_0 technology to produce a differentiated commodity without having to overcome the coalitions' resistance. One only has to think of home production of goods and services in developing countries for an analogy to gain insight into how and by whom this technology may be employed.

Only the industrial production sector is characterized by monopoly. Workers in the industrial sector can form coalitions with which monopoly rights are associated. Thus, the initial state of differentiated good industry i is the initial size of the coalition in that industry. All industries have the same state. In this model, denial of entry via strategic deterrence of factor supplier coalitions is the only element that stunts *perfect* competition in the output market in the industrial sector. Entry obstruction applies only to the π_2 technology firms, but for those operating with the π_1 technology there is free entry and exit.

For any industrial firm that employs the π_1 technology, let a coalition in that industry be endowed with the rights to (1) dictate work practices, (2) set the wage rate, and (3) limit its membership size. Through these rights to dictate work practices the coalition will determine the productivity level $\pi_x \leq \pi_1$ of any such firm that operates the π_1-capable technology. We assume that these rights are protected throughout the life of a coalition, the length of which depends on the ability to provide surplus to its members.

The cost of overcoming the resistance of a coalition by any entering new firm employing the π_2 technology is the wages paid to $N\phi$ units of labor services, where $\phi > 0$. This assumption ensures that all results are population-size invariant. A free rider problem exists, but only in the subsequent periods, as there is no more resistance to overcome, and other firms employing the π_2 technology can enter at will. For simplicity's sake, it is assumed that no other group can use the π_2 technology in the period that resistance is surmounted.

An Entry-Deterrence Game and its Equilibrium Concept

Next, the entry game of an industry is described, symmetric *no-entry steady state* equilibrium defined, and a catalogue of necessary and sufficient conditions for such a steady state is given.

There exists an equilibrium for this strategic game. An equilibrium can be that of no-entry steady state or with entry in every industry.[30] Equilibrium requires and can be characterized by utility maximization in the household sector, profit maximization in the farm sector, market clearing, *and* a subgame perfect equilibrium to the game outlined below in each industry i.

In this strategic game, there are two players for every industry i: the coalition of factor suppliers and a potential entrant. The two players take as given industry i's output demand and the wage in the competitive farm sector. Each industry is small relative to

[30] There can be multiple equilibria, but the one most relevant should be that with the least entry. A brief outline of the existence proof can be found in Parente and Prescott (1997) and we shall not dwell on it here.

the economy and so output demand is taken parametrically, and players' behavior has no bearing on industry demand or farm wages.

First Stage (Coalition Size): (*1*) Each member of the coalition decides non-cooperatively whether to remain a member and work in industry i in the current period, or leave the coalition and move to the farm sector. All workers are equal and leaving is voluntary. Therefore, remaining workers and leavers derive equal utility and if there are *both* remaining workers and leavers, then everyone must earn the farm sector wage.

(*2*) The coalition decides if and how many new members will be admitted. Let $N_{x,i}$ denote the number (measure) of coalition members in industry i in the period. Then, $N_{x,i}$ consists of remainders plus joiners less leavers. Let $w_x\left(N_{x,i}\right)$ and w_a be the wage paid a coalition member in industry i, which is a function of $N_{x,i}$, and the farm sector wage, respectively. In equilibrium, it must be the case that $w_x\left(N_{x,i}\right) \geq w_a$.

Second Stage (Firms' Entry Decision): The potential entering firm with the π_2 technology decides whether to invest $N\phi$ and overcome the resistance to the use of this superior technology.

Third Stage (Coalition's Response): (*1*) If the potential entrant does not make that $N\phi$ investment, then the coalition chooses (*a*) a productivity level $\pi_x(i) \leq \pi_1$ for existing firms that operate the π_1 technology;[31] and (*b*) $w_x\left(N_{x,i}\right)$.

(*2*) If the entering investment is made, then (*a*) the coalition chooses $\pi_x(i)$ and $w_x\left(N_{x,i}\right)$, and make available its workers to the entrant and competing firms as well;[32] and (*b*) the entrant chooses output price p_E noncooperatively.

Conditional on entry, there is effectively Bertrand (price) competition where the entrant has marginal cost w_a/π_2 and no capacity constraint, i.e. each firm can produce any quantity demanded by consumers.[33] The coalition has zero marginal cost up to the capacity constraint $\pi_1 N_{x,i}$ because its members are tied to that industry for the period. In equilibrium, the Bertrand price competition leads to the perfectly competitive market outcome.

There are $i+1$ goods in this economy, industrial (differentiated) and agricultural goods. Let the agricultural good be the numeraire good for our economy. Let p_i denote the price of differentiated good i in units of agricultural goods.

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[31] The coalition dictates work practices by picking from an array of productivity levels that are always less efficient than or as efficient as that which the firms' technological capability implies.

[32] This is required for subgame perfection, i.e. an equilibrium concept that rules out non-credible threats.

[33] Marginal cost of firms with π_0 or π_2 technology is: $MC_{\pi_2,\pi_0} = \dfrac{\partial TC}{\partial X} = \dfrac{\partial\left(w_a N_x = w_a X/\pi_{0,2}\right)}{\partial X} = \dfrac{w_a}{\pi_{0,2}}$. That is because a worker required for producing an *additional* unit of output using these two technologies only needs be paid farm wages as he is not in the coalition.

Definition (Steady State): The system is in a steady state when there is no change in the membership size of the coalition in each industry, i.e. $N_{i,t} = N_i, \forall i$. Moreover, in a *symmetric* steady state with no entry, $p_i = p, \forall i$.

We can, therefore, analyze a representative industry in the steady state. As long as there is no adoption of the π_2 technology (i.e. no entry), the equilibrium outcomes are the same in all periods.

Let $F : \Re_+^3 \to \Re$ be the farm sector production function in the steady state to be derived from $\Im$; r denote the rental price of a unit of land; N_a be the measure of farm-worker households (or equivalently in equilibrium, the measure of input of labor services in the farm sector); N_x be the measure of industrial worker households (or equivalently in equilibrium, the measure of input of labor services in the industrial sector); h be household type categorized according to worker type, where $h = a$ denotes agricultural-worker household and $h = x$ for industrial-worker household; (a_h, x_h), for $h \in \{a, x\}$, be household consumption allocations of agricultural and industrial goods; (A, X_a, N_a, L_a) be farm sector allocations; (X, N_x) be representative industry allocations; and π_x be productivity level.

Definition (No-entry steady-state "monopoly rights" equilibrium): A *no-entry steady-state "monopoly rights" equilibrium* is a catalogue of prices, (p^M, w_a^M, w_x^M, r^M), allocations $(A^M, X_a^M, N_a^M, L_a^M; X^M, N_x^M; a_a^M, x_a^M, a_x^M, x_x^M)$, and productivity π_x^M such that:[34]

(A) Farm sector profit is maximized.[35] Given the price system (p^M, w_a^M, r^M) and that in steady state,

$$A = F(X_a, N_a, L_a) \equiv \left[\psi X_a^{\rho} + (1-\psi)\cdot\left(N_a^{\alpha} L_a^{1-\alpha}\right)^{\rho}\right]^{1/\rho}, \tag{4}$$

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[34] The M superscripts signify "monopoly rights" equilibrium prices, allocations, and productivity level/work practice variable. We wish to distinguish these values from those of the competitive equilibrium, which will be defined later.

[35] Since firms in the farm sector behave competitively, they take prices parametrically. Moreover, because the production function in the farm sector is constant returns to scale, firm size and the number of firms do not matter, and we can aggregate up to a representative firm. The maximization problem of the representative firm then becomes:

$$\max_{(X_a(\cdot), N_a, L_a)} \left[A - \int_0^1 \left(p_i^M \cdot X_{a,i}\right) di - w_a^M N_a - r^M L_a \right]$$

subject to (2).

Since $p_i = p$, $\forall i \in [0,1]$, profit maximization implies $X_{a,i} = X_a, \forall i \in [0,1]$, i.e. equal acquisition of each intermediate good by firms in the farm sector to be used as inputs. Let $A = F(X_a, N_a, L_a)$ denote farm output when this is the case, and obtain (4) from (3). Profit maximization with respect to the three choice variables yields the necessary equilibrium conditions (5) – (7).

the representative agricultural firm picks $\left(X_a^M, N_a^M, L_a^M\right)$ such that

$$p^M = F_X\left(X_a^M, N_a^M, L_a^M\right), \tag{5}$$

$$w_a^M = F_N\left(X_a^M, N_a^M, L_a^M\right), \tag{6}$$

$$r^M = F_L\left(X_a^M, N_a^M, L_a^M\right). \tag{7}$$

(B) Household utility is maximized.[36] Given the price system $\left(p^M, w_a^M, r^M\right)$, the following necessary conditions must hold for a household of worker type $h \in \{a, x\}$:

$$p^M = \frac{\left(x_h^M\right)^{\eta-1}\left(a_h^M\right)^{1-\eta}}{\mu}, \tag{8}$$

and

$$a_h^M + p^M \cdot x_h^M = w_h^M + r^M. \tag{9}$$

(C) Market clearing condition. The markets for differentiated goods, agricultural goods, labor, and land must clear:

$$\sum_h N_h^M x_h^M + X_a^M = X^M, \tag{10}$$

$$\sum_h N_h^M a_h^M = A^M, \tag{11}$$

$$N_a^M + N_x^M = N^M, \tag{12}$$

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[36] Workers of different types gain different incomes and consequently have different demand functions. Taking prices as given, a household of type h chooses an infinite sequence of differentiated and agricultural goods to maximize the discounted stream of utility subject to the Arrow-Debreu intertemporal budget constraint:

$$\max_{\{x_{h,t}(\cdot), a_{h,t}\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t \left\{ \left[\int_0^1 (x_{h,it})^{\eta} di + \mu \cdot (a_{h,t})^{\eta} \right]^{\frac{\theta}{\eta}} - 1 \right\} \Big/ \theta$$

s.t. $$\sum_{t=0}^{\infty} \left(a_{h,t} + \int_0^1 \left(p_{i,t}^M \cdot x_{h,it} \right) di \right) \leq \sum_{t=0}^{\infty} \left(w_{h,t}^M + r_t^M \right),$$

and other usual nonnegativity constraints. Using the no-entry steady state conditions that $p_i = p$, and $x_{h,i} = x_h, \forall i \in [0,1]$, (8) can be obtained, and using the no-entry steady state condition that the income of a household of each type is the same in every period, we obtain (9).

$$L_a^M = N^M . \tag{13}$$

(D) Subgame perfection in which the following necessary conditions – minimal-deterrent entry condition, per-member income maximizing conditions, and entry-deterrent condition – hold:

$$\max_p \left[\left(p - \frac{w_a^M}{\pi_2} \right) \cdot \left(D(p) - \pi_1 N_x^M \right) \right] = w_a^M N^M \phi , \tag{14}$$

where $D(\cdot)$ is quantity demanded for differentiated goods,

$$p^M = \frac{w_a^M}{\pi_0} , \tag{15}$$

$$w_x^M = \frac{D\left(w_a^M / \pi_0\right)}{N_x^M} \cdot \frac{w_a^M}{\pi_0} , \tag{16}$$

$$\pi_x^M = \frac{D\left(w_a^M / \pi_0\right)}{N_x^M} , \tag{17}$$

and

$$w_x^M \geq w_a^M . \tag{18}$$

∎

Conditions (4)–(18) are both necessary *and* sufficient for a no-entry steady-state "monopoly rights" equilibrium.

Condition (4) gives steady state equilibrium value of output from the agricultural sector, that sector in which there are no inherent "monopoly rights". Conditions (5)-(7) state that factor input (real) prices equal their respective marginal products. Condition (8) states that the ratio of differentiated good and farm good prices is equal to the ratio of the respective marginal utilities of their consumption. Condition (9) states that households exhaust their budgets in equilibrium since preferences are locally nonsatiated (in this case, the utility function is monotonic). Conditions (10)-(13) state that quantity supplied must equal quantity demanded in every market in equilibrium.

Conditions (14)-(18) arise from subgame perfection, a refinement of the Nash equilibrium solution concept, which must be satisfied to ensure that the equilibrium solution obtained through agents' utility and firms' profit maximization is consistent with players' strategic behavior and that noncredible threats are not exercised in equilibrium. For detailed explanation and derivation of these equilibrium conditions, consult Appendix A.

Condition (14) states that, in equilibrium, the entrant will pick an output price such that its maximum profit will be zero upon entering the market with its π_2 technology.[37] That is, the maximum profit generated from residual demand will exactly equal the investment it has to make to overcome resistance and enter the market; hence, the minimal-deterrent entry condition. Notice that in every industry i, coalition workers at the existing π_1 technology firms supply output at the most efficient level of work practices that they can and thus produce the maximum level of output that their technology is capable of at $\pi_1 N_{x,i}$. The reason is that given a price set by the entrant, the coalition maximizes its per member income by choosing $\pi_{x,i} = \pi_1$ to *minimize* the entrant's profit, an attempt at deterring entry. Confronted by an entering firm armed with better technology, the rational (i.e. per member income maximizing) coalition of factor suppliers has no choice but to set their work practices at the best standard available to compete in every industry at the *threshold* of the entry/no entry decision. One could even argue that the same effect on work practices would materialize whenever entry threat prospects are credible. Alternatively, it can also be articulated that a reform of work practices transpires once entry is imminent or in fact occurring in sectors where regulatory barriers that aid status quo participants abound.

Condition (15) states that the compensation-maximizing coalition of workers will set work practices and wage rate so that equilibrium price equals marginal cost at every competing π_0 technology firms.[38] Alternatively, it states that the choice of work practices and wage rate set by the coalition must be consistent with an equilibrium condition that the wage rate paid to a worker at a π_0 technology firm has to equal his marginal revenue product (output price times his marginal product, π_0).

Condition (16) states that equilibrium profit is zero at every π_1 technology firm as total revenue equals total labor cost, that is the wage rate paid to coalition members equals their marginal revenue product. Condition (17) is a market clearing condition, stating simply that quantity supplied of each differentiated good equals its corresponding quantity demanded in equilibrium, given the price system.

Existence and uniqueness of no-entry steady state "monopoly rights" equilibrium can be shown through the computational procedure that reduces to finding a fixed point of a continuous function of a single unknown argument, N_a, as will be outlined in the computation part below.

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[37] The first term inside the argument maximum operator is the difference between output price and marginal cost per unit of output. The second term is the residual demand, unsatisfied by the competing π_1 technology firms employing coalition members.

[38] Otherwise, if equilibrium price exceeds marginal cost of π_0 technology firms, there will be positive profit associated with using π_0 technology and more π_0 technology firms producing differentiated goods, and fewer coalition workers will be employed, which is inconsistent with the already chosen coalition-member-compensation-maximizing $N_{x,i}$. If the marginal cost of π_0 technology firms exceeds equilibrium price, then all π_0 technology firms will perish, shedding workers as a result. These workers will either have to work in the farm sector or for π_1 technology firms and become members of the coalition by default. More members will dilute income per share of coalition members, *ceteris paribus.* This is also inconsistent with the compensation-maximizing choice of $N_{x,i}$.

Competitive Equilibrium

In order to demonstrate how much benefit society will gain with the elimination of the "monopoly rights" arrangement, a concept of an alternative arrangement has to be explored – that is the competitive-market equilibrium with no "monopoly rights". In this particular economy, there exists a unique competitive equilibrium.[39]

Definition (Competitive Equilibrium): A *steady-state competitive equilibrium* is a catalogue of prices, $\left(\hat{p}, \hat{w}_a, \hat{w}_x, \hat{r}\right)$ and allocations $\left(\hat{A}, \hat{X}_a, \hat{N}_a, \hat{L}_a; \hat{X}, \hat{N}_x; \hat{a}_a, \hat{x}_a, \hat{a}_x, \hat{x}_x\right)$ such that:

(A) The list $\left(\hat{p}, \hat{w}_a, \hat{w}_x, \hat{r}\right)$ and $\left(\hat{A}, \hat{X}_a, \hat{N}_a, \hat{L}_a; \hat{X}, \hat{N}_x; \hat{a}_a, \hat{x}_a, \hat{a}_x, \hat{x}_x\right)$ satisfy conditions (4)-(13).

(B) $$\hat{p} = \frac{\hat{w}_x}{\pi_2}, \tag{19}$$

$$\hat{X} = \pi_2 \hat{N}_x, \tag{20}$$

$$\hat{w}_x = \hat{w}_a. \tag{21}$$

∎

Conditions (4)-(13) and (19)-(21) are necessary and sufficient for a competitive equilibrium. Condition (19) states that equilibrium differentiated output price equals marginal cost a competitive firm faces since firms in this sector employ π_2 technology. Condition (20) states that in equilibrium differentiated goods are produced with π_2 technology. Condition (21) states that workers are indifferent between working in either sector because there is no longer a coalition of factor suppliers in the industrial sector.

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[39] The proof can be outlined thus: Uniqueness of the competitive equilibrium is easy to prove. Preferences are strictly concave and locally nonsatiated. Therefore, if there exists a competitive equilibrium, its uniqueness is guaranteed.

The First Welfare Theorem argument is employed to prove existence. That is, we argue that a solution to the social planner's problem exists, is unique, and can be supported as a competitive equilibrium allocation. The social planner's problem is a sequence of static problems. Moreover, the allocations $x_i = x, \forall i \in [0,1]$, strictly dominate any other allocations, thereby reducing the planning problem to a finite dimensional optimization program. Note that the objective function approaches ∞ as the choice variables x and a approaches 0. Thus, the planner's problem amounts to maximizing a continuous objective function over a closed and bounded constraint set in a finite dimensional space -- a compact set -- given a restriction on x and a such that $0 < \varepsilon \leq x, a$ and $x, a \leq L < \infty$. With this restriction, Theorem of the Maximum guarantees that a maximum exists, and is an interior Pareto optimum. Given that the objective function is strictly concave, the Pareto optimal allocation is unique.

Since (1) preferences are convex, continuous, and locally non-satiated, (2) the aggregate technology set is convex, and (3) the commodity space is finitely dimensional, this unique Pareto optimum can be supported as a quasi-competitive equilibrium allocation. The price system can be found that is positive since all the marginal products are positive and marginal utilities strictly positive. A less costly point in the consumption set exists. This suffices to ensure that a quasi-competitive equilibrium allocation with the said price system is a competitive equilibrium.

Let Y denote total value added or aggregate production in the model economy.[40] Then, since X_a is the intermediate goods used in sector A, $Y^M = \left(A^M - p^M X_a^M\right) + p^M X^M$ and $\hat{Y} = \left(\hat{A} - \hat{p}\hat{X}_a\right) + \hat{p}\hat{X}$.

Section V: A Computational Experiment and its Findings

Econometric Methodology Used

It must be emphasized that all models are, by nature, stylized and abstract. Given enough data, statistical hypothesis testing with an emphasis on signal-to-noise ratios will most likely reject any such artificial edifice along some dimension. Consequently, rejecting a model because of its abstract nature is irrational, as all models *are* abstraction.

In the tradition of Frisch (1933) and Kydland and Prescott (1994) in their original sense of the term "econometric tool," a model in this case is taken simply as a measuring device, much like a thermometer is in the physical sciences. By these researchers' definition, computation experiment is an econometric tool since it is used to derive the quantitative implications of economic theory.

Much like a thermometer, the construction of which is based on the theory that mercury expands approximately linearly within a certain range of temperatures at a given air pressure, the model we use is based on well-tested economic theory. Logically, then, much like the need to calibrate a thermometer to read 0 degree Celsius when immersed in iced water and 100 degrees Celsius when immersed in boiling water, an economic model's parameters can be calibrated so that the abstract model mimics reality along some relevant dimensions and is ready for use. Also, much like the process of recalibrating a thermometer when used on Mount Everest as opposed to at sea level, the reliability of which is based on theory, the ability to recalibrate an economic model with reliability should not present a problem if the theory on which the model is built is rigorous and sound across economies.

A quantitative model is considered useful if it provides a concrete answer to an interesting, well-posed question. It may be suitable, by design, for a certain narrow class of questions, and not for others. Any judgment on an abstraction, therefore, should be made relative to a particular class of relevant questions.

The question has been posed, well-tested theory used, a model economy constructed, and now we are ready for a computational experiment to record the long-run outcomes of the model's agents' economic behavior under the two arrangements. Our next step is to calibrate the model to Thailand's "stylized facts". This step is performed in order for

[40] The magnitude of Y can be derived by any of the 3 equivalent methods: (1) Y as total value added, i.e. sum of final products less intermediate goods in each sector (A and X), as above. (2) Y as total income, i.e. sum of wage income in two industries and land rental income. (3) Y as total products available for final use. This is made clear in our computation toward the end of the paper. Our focus is on the shares and ratios, and so we are not concerned with absolute magnitudes of model or data aggregates. In any case, we shall establish a correspondence between real-world data and model aggregates in our calibration process below.

us to be certain that the model gives an approximately correct answer to some questions with *known* answers, so that we may have some confidence in its application.[41]

"Stylized Facts" of Growth in Thailand

The following "stylized facts" for Thailand's economy are organized from the empirical regularities along some dimension observed the country over time.[42] These "stylized facts" will be used in the process of establishing a correspondence between the real world, as represented by the data, and the simple "stylized" model economy as outlined in the previous section.

The process of calibrating a model economy to that which is observed is used widely as a method to prepare the measuring device (i.e. the model) for an analysis of well-defined economic questions, and an evaluation and prescription of economic policies. These "stylized facts" help provide an empirical locus standi to the articulated theoretical concept.

We use empirical regularities observed in the US to establish a corresponding set of stylized facts of the "free enterprise" arrangement, noting that the US is a prime example of such an economy under that arrangement and is generally agreed to have been on a balanced growth path for the past two centuries.

In the process of this computation experiment, we first restrict the model by specifying the empirical counterparts of sectors A and X. After that, we deal with the treatment of capital, which exists in the real world, but does not figure into the model. Finally, a set of preference, industrial sector technology, and farm sector parameters, $((\eta,\mu),(\pi_0,\pi_1,\pi_2,\phi)$, and (α,ψ,ρ), respectively) can be calibrated and a computational experiment can then replicate the key "stylized" relations among model aggregates.

We shall then be ready to study and compare long-term predictions of the model in regard to selected model aggregates under the two arrangements. Conceptually speaking, our intention is to compare the two arrangements holding a model's agents and inherent economic potential, represented by its preference and technology parameters, essentially invariant across time.

Criterion for separation of A and X empirically: The defining feature of the A sector in the model's "monopoly rights" arrangement is that there are *no* protected "monopoly rights" connected with the currently operating technology for producing this good. That is, existing technology is used rather efficiently and adoption of better technologies (or entry of firms with better technologies) is *not* effectively deterred. In "free enterprise" arrangement, however, there is no such difference between A and X, but there are other differences as shall be expounded further below.

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[41] For a good reference on computation experiment as an econometric tool, see Kydland and Prescott (1994).

[42] There are several unfavorable elements that a calibration attempt has to confront in an economy that is not in a steady state like Thailand. We must assume for the purpose of simplicity that despite all the changes going on in the Thai economy in the past 40 years, there are certain elements or dimensions of the economy that are relatively unchanged. These features are then organized into our "stylized facts".

Monopoly rights in our context may originate from various forms of barriers. They include, but are not limited to, taxes, tariffs, and duties, government regulations, licenses to operate a business, strong labor unions, or even informal or underhand tactics or means to deter entry or adoption of better technology.[43]

Sector A: In general, the most significant empirical counterpart for A's product in less-developed and developing countries consists of agricultural and farm goods, and household services and production – part of which can be classified under the so-called "informal economy" that is not measured in the national accounts. The value added in agriculture is recorded at about 10 per cent of Thailand's GDP from 1993 to 2001. In a developing economy like Thailand, unlike in rich countries, much of the production of these household services takes place outside of the market sector, and is therefore not part of the national accounts.

In the case of Thailand, the part of these services that are not officially measured should be imputed. Examples of services that are included in Thailand's national accounts are repairs of vehicles, hair salons, and other private household economic activities with employed persons. There remains an "informal" economy of substantial size in Thailand.[44]

In the process of estimating the size of sector A for a real economy from the national income accounts, we define $A \equiv \theta_A \cdot (GDP)$, where θ_A denotes the share of sector A in the total value added of the economy. From the defining feature of model's sector A, that is "no monopoly rights" or "no MR," we have:

$$A = (\text{Unambiguously "no MR" sectors}) + \theta_A \cdot (\text{Ambiguously "no MR" sectors}) \qquad (22)$$

From Table 4 of Thailand's GDP report by the National Economic and Social Development Board (NESDB) in 2002, we classify agriculture, hotels and restaurants, and private households with employed persons as the sectors that are unambiguously *not* associated with monopoly rights arrangement, and the following sectors as ambiguous: manufacturing, electricity, gas and water supply, real estate, renting, and business activities, construction, wholesale and retail trade, repair of vehicles, and personal and household goods, transport, storage and communication, real estates, renting, and business activities, education, health and social work, and other community, social and personal service activities. The rest, namely mining and quarrying, financial intermediation, public administration and defense and compulsory social security are classified under "unambiguously associated with monopoly rights." Using the above GDP accounts, we estimate θ_A or A/Y to fluctuate narrowly around an average of 0.57 from 1993-2001.[45] As a test of the model's convincing ability, this is what we expect to

[43] For instance, over-stocking of merchandises with an intention to dump them in the market as an entry deterrent, relationship between producers and retailers to eliminate competing goods from the shelf space, bundling of products with market power and those without to stymie competition in both markets, so on and so forth.

[44] One estimate reported in Phongpaichit et al (1998) of tax evasion and the (legal) informal sector covering such activities as self-employment, vending, casual work and other household work not captured by official national accounts' measures amount to almost 60 per cent of (official) GDP.

[45] If we assume that the size of informal economy is 30 per cent of GDP and consider the informal economy as part of "unambiguously "no MR" sectors" in (22), an assumption that is not entirely

see roughly matched by one of the independent results from the model, as this number is independent of any other stylized facts the calibrated model is supposed to mimic.

Our result and policy implication will not change qualitatively, however, with the addition of the "informal economy". We know that the larger the estimated size of the informal economy, the higher the difference in TFPs under two arrangements will be, *ceteris paribus.* Hence, the larger the "informal economy", the larger the impact of abolishing "monopoly rights" in favor of "free enterprise" arrangement will be.[46]

We believe it is plausible that the size of Thailand's informal economy could be anything around 50-60 per cent of (official) GDP and may average roughly 30 per cent in the long run as Thailand's real per capita GDP increases. Our reasoning is provided in Appendix B.

We resolve not to consider adding the informal economy into our computational experiment at the moment, but note that it could be done with more knowledge or assumptions about the wage and land rental rates, and intermediate goods share in this sector.

Data and evidence from the literature in development economics suggest that A / Y in richer countries should not differ much from that of poor countries, as services constitute a major part of GDP and most of the value added in services originates in A (in the context of "free enterprise" arrangement in the model).

Since X consists of differentiated goods and services from these goods and the model does not have capital as input, when we map the model to the data, we need to consider consumption of fixed capital (or depreciation) and other capital goods as intermediate (differentiated) goods and include them in X.

An important model aggregate that is of interest is fraction of total employment in each sector. First, we find the fractions of total employment for sectors A and X from the labor force surveys for both Thailand and the US. The calculations should be made along the same delineation as that made in the GDP accounts in our measurement of θ_A. The figure for the US's sector A is taken to be 0.14.

Stylized Fact 1: Sector A's fraction of total employment is 0.73 in Thailand, and 0.14 under the "free enterprise" arrangement.[47]

Next, using Tinakorn and Sussangkarn's (1998) Table 9, we obtain average land rent share in the agricultural sector to be 0.05 from 1980-1995, whereas the average wage share in the agricultural sector is estimated to be approximately 0.38 during the same period. Therefore, if we use these estimates, we get an approximate share of land rental

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unreasonable, then we estimate A/Y to average 0.81. If the size of informal economy is 60 per cent of GDP, then we estimate A/Y to be 0.88.

[46] If we add the "illegal economy", estimated by Phongpaichit, et al (1998) to be 15-20 per cent of GDP, into model economy's sector A, then we will see even more quantitative differences. This estimate is not implausible. The sex sector alone accounts for between 2-14 per cent of GDP in Indonesia, Malaysia, the Philippines, and Thailand as reported by Edlund and Korn (in the *Journal of Political Economy*, Feb 2002.)

[47] The figure 0.73 is the average of fractions of employment in 1998-2001, which are 0.73 in all of the four-year period.

income to the sum of land rental and sector A's wage income to be roughly 0.12. The same share is roughly 0.14 in the US, but for the sake of simplicity in the calibration process, we assume that it is 0.12 in the "free enterprise" economy as well.

Stylized Fact 2: Land rental income relative to the sum of land rental and sector A's wage income is 0.12 in Thailand and 0.12 under the "free enterprise" arrangement.

The share of intermediate goods, as defined in the model, in total sector A product is difficult to estimate. We think of intermediate goods under "monopoly rights" as those directly used in the production process, viz. fertilizers, depreciation of tractors, machines, etc., and not as interest payments to owners of capital lent to farm households in the past. Parente and Prescott (1997) estimates this figure for India to be roughly 0.02. We believe the figure for Thailand ought to be higher, and closer to 0.10. The intermediate goods' share of total sector A's product is estimated to be 0.72 in the US.

Stylized Fact 3: The intermediate goods' share of total Sector A's product is 0.10 in Thailand and 0.72 under "free enterprise".

From Thailand's labor force survey, average wage rate weighted by the number of employed persons in sector A is 5,849 baht per month while average wage rate weighted by the number of employed persons in sector X is 15,420 baht per month.[48] This implies that the economic rents received by workers in the differentiated goods sector X under "monopoly rights" arrangement are approximately 160 per cent, implying that $w_x / w_a = 2.6$.

Stylized Fact 4: The economic rents received by workers in the differentiated goods sector X are 160 per cent of sector A's wage in Thailand.

A numerical experiment is now performed with the assumption that the size of the informal economy is negligible, or that official statistics have already captured it. The sort of wisdom we expect to gain will be predicated on an approximate TFP difference if "free enterprise" instead of "monopoly rights" had characterized Thailand's modern economy since it establishment until today. We may also consider our results as an approximate long-run TFP difference between the two arrangements if Thailand eliminates the current "monopoly rights" arrangement and implements "free enterprise" today.

Computation of "Monopoly Rights" Equilibrium

In solving for a candidate for steady-state no-entry equilibrium allocations and the price system for the economy in which the coalition of factor suppliers sets work practices, wage rate and membership size, the problem can be reduced to a one-dimensional search over N_a. Taking a value of N_a and the parameters as given, all the other variables can be solved by writing conditions (4)-(18) in terms of this variable.

[48] All figures are obtained by the BOT through the National Statistical Office. Average wages in sectors that we classify as "unambiguously not associated with monopoly rights" range from 2,500-5,500 baht per month. Average wage weighted by the number of employed persons in these sectors is 2,911 baht per month. On the other hand, average wages in sectors that we classify as "unambiguously associated with monopoly rights" range from 10,000-17,000 baht per month. Average wage weighted by the number of employed persons in these sectors is 12,192 baht per month.

We report the parameter values that are calibrated for equilibrium computation under both arrangements in Table 3. There are 12 parameters in total; however, 3 of them do not enter into steady-state analysis, namely θ, β and σ. The values of industrial sector technology parameters π_0, π_1 and π_2 matter not in absolute, but in relative terms, as their absolute values do not matter for the results. Without loss of generality, let π_0 be set to 1.

In selecting the values of π_1 and π_2, we pay attention to what may be reasonable differences between *potential* productivities of successful technologies. It is not unreasonable to assume that, if used efficiently, the next technological innovation can be 2 to 3 times more productive than the currently operating technology. We, therefore, select $\pi_1 = 3.0$ and $\pi_2 = 9.0$.

The remaining 6 parameters, $\alpha, \phi, \eta, \mu, \rho$ and ψ, are calibrated so that the equilibrium outcomes under the two arrangements match Stylized Facts (1)-(4) above, i.e. $N_a = 0.73$ under "monopoly rights" (MR) and 0.14 under "free enterprise" (FE); $rL_a/(rL_a + w_a N_a) = 0.12$ under both arrangements; $pX_a/A = 0.10$ under "MR" and 0.72 under "FE"; and finally, $w_x/w_a = 2.6$ under "MR".

Table 3

Parameter Values Used in Computation Exercises

Preference Parameters	Industrial Sector Technology Parameters	Agricultural Sector Technology Parameters
$\eta = -0.035$ $\mu = 1.575$	$\pi_0 = 1.00$ $\pi_1 = 3.00$ $\pi_2 = 9.00$ $\phi = 0.14$	$\alpha = 0.88$ $\rho = 0.61$ $\psi = 0.30$

The results in Table 4 mimic what we observe in the real world along crucial dimensions. In matching these results with reality, we may think of an economy under "monopoly rights" as a poor country (e.g. Thailand) and the other as a rich country (e.g. the US). The higher the industrial sector labor productivity, the higher the industrial pay. Under "free enterprise", wages equalize across sectors, and so farm households face the same budget constraint as that of industrial households. They consume the same per-capita amount. Unlike under "monopoly rights", there is no economic rent to be derived. Moreover, under "free enterprise", farmers (sector A's entrepreneurs) use much less labor input, but much more differentiated goods. Under "monopoly rights", farm households are poorer and consume less per-capita than industrial households. Prices are also different across arrangements. Industrial goods are more expensive (in terms of farm goods) under "monopoly rights" than under "free enterprise".

Note that the individual and aggregate allocations in Table 4 are not to be compared directly across arrangements/economies. In order to make a correct comparison, we first need to have a concept of allocations and products that are comparable, as the two economies have different relative prices. Therefore, we need to obtain a common set of "international prices" with which we can use to compute real GDP at purchasing power parity (PPP) and compare their values. In doing so, we follow the Geary-Khamis approach that the Summers-Heston Penn World Table uses to obtain real GDP at PPP (see our Appendix C or Kravis, Heston and Summers (1982) for further details).

The computation of relative Gross Domestic Product (GDP) at PPP shown in Table 5 is shown in Appendix C. GDP can generally be derived using 3 equivalent methods. In our context, they are: (1) GDP as total value added, i.e. $Y = \sum_{A,X} (\text{Value Added}) = (A - pX_a) + pX$. (2) GDP as the sum of final products, i.e. $Y = A + p(X - X_a)$. And, (3) GDP as total income generated in the economy, i.e. $Y = \sum_{A,X} (\text{Income}) = (w_a N_a + rL_a) + w_x N_x$.[49] Moreover, GDP recorded in this paper is not only an aggregate figure, but is also *per capita* since the measure of population, N, is 1.

The "monopoly rights" equilibrium concept is supposed to describe the current equilibrium law of motion governing the markets in Thailand approximately well, while the "free enterprise" concept is supposed to describe the law of motion governing the economic state of the world in the US.

Note that the results reported in Table 5 are quantitatively sensible along these dimensions:

(1) The value of A/Y estimated from Thailand's data is around 0.57 while the parameterized model records it to be 0.61, which roughly matches our prior. A transformation from "monopoly rights" into "free enterprise" arrangement would see the sizes of A and X relatively unchanged in aggregate terms. This can be substantiated by real world observations, wherein services account for much of GDP and constitute a sizable majority of A in a rich "free enterprise" country. The industrial sector, X, takes a lion's share of the total value added under "free enterprise", almost doubles the size of that under "monopoly rights"; on the other hand, sector A's share of the total value added shrinks by almost 3.4 times.

[49] At this point one can also appreciate the benefit of a good theory on which the neoclassical production function is founded. The neoclassical production function, by virtue of its being a convex cone (homogenous of degree one, constant returns to scale) yields the following simplicity under zero profit condition:

$$p_a A = A = F(X_a, N_a, L_a) = \frac{\partial F}{\partial X_a} \cdot X_a + \frac{\partial F}{\partial N_a} \cdot N_a + \frac{\partial F}{\partial L_a} \cdot L_a = pX_a + w_a N_a + rL_a,$$

and $pX = p \cdot G(N_x) = \frac{\partial G}{\partial N_x} \cdot N_x = w_x N_x$. That is, the neoclassical production theory is both a theory of the income and the product sides of the national income accounts.

(2) The unit price of the industrial goods relative to the A goods is 3.24 times higher in the poor country with "monopoly rights" (in this case, Thailand) than in the rich country with "free enterprise". We find that this is roughly the ratio of the prices of investment goods to consumption goods across rich and poor countries in the Summers and Heston data (3-4 times).

And, (3) The relative GDP in PPP terms recorded in Table 5 is 3.07. Since there is no capital in the model and other inputs, namely labor and land services, are assumed to be similar across arrangements, this number is equivalent to the difference in TFPs between the two arrangements. This figure is consistent with the relative TFP figure between Thailand and the US that is recorded in Table 7 of Hall and Jones (1998). At 0.369 times the US's TFP -- i.e., US TFP is roughly 2.7 times that of Thailand -- our figure (3.07) seems quite reasonable. The model suggests that should these two countries maintain their current arrangements, they should find the difference in TFPs to be roughly 3 in the long run.

Table 4

Equilibrium Prices and Allocations under 2 Economic Arrangements

Monopoly Rights Economy, (x^M)	**Free Enterprise Economy,** $(\hat{x})$
Price System:	Price System:
$p = 0.55$	$p = 0.17$
$w_a = 0.55$	$w_a = 1.50$
$w_x = 1.43$	$w_x = 1.50$
$r = 0.055$	$r = 0.029$
Household Allocations:	Household Allocations:
$a_a = 0.37$	$a_a = 0.95$
$x_a = 0.43$	$x_a = 3.46$
$a_x = 0.91$	$a_x = 0.95$
$x_x = 1.05$	$x_x = 3.46$
Aggregate Inputs and Products:	Aggregate Inputs and Products:
$X_a = 0.11$	$X_a = 4.28$
$N_a = 0.73$	$N_a = 0.14$
$L_a = 1.00$	$L_a = 1.00$
$N_x = 0.27$	$N_x = 0.86$
$A = 0.52$	$A = 0.95$
$X = 0.70$	$X = 7.74$
$Y = 0.84$	$Y = 1.53$

The ability and incentive of a group of factor suppliers in the model to earn monopoly rents by deterring the adoption of better technologies depends on the cost of overcoming that resistance as well as how superior that new technology is. We also find through numerical experiments that the result that better technology is not adopted in

the monopoly rights economy while instead the inferior technology is used inefficiently, is robust to alternative values of preference and technology parameters. Only when $\pi_2/\pi_1 > 7.0$ do we find that groups have no incentive to block the π_2 technology in equilibrium. Under any of those parameterizations, the π_2 technology will be used, and used efficiently, under the "monopoly rights" arrangement.

Table 5

Comparison of Quantitative Performances under the Two Arrangements

	Monopoly Rights Arrangement	Free Enterprise Arrangement
Relative GDP at PPP (with "MR" as numeraire economy)	1.00	3.07
Shares of Final Product		
Industrial Goods, $p(X - X_a)/Y$	0.39	0.38
Agricultural Goods, A/Y	0.61	0.62
Shares of National Income		
Land Rent Income, rL/Y	0.06	0.02
Industrial Wage Income, $w_x N_x/Y$	0.46	0.84
Agricultural Wage Income, $w_a N_a/Y$	0.48	0.14
Shares of Valued Added		
Industrial Sector, pX/Y	0.46	0.84
Agricultural Sector, $(A - pX_a)/Y$	0.54	0.16
Relative Wages		
w_x/w_a	2.60	1.00
Industrial Sector Productivity[50]		
π_x	2.60	9.00
Relative Output Prices		
$p = p_x/p_a$	0.55	0.17

Section VI: Interpretation of Results, Policy Implication, and Conclusion

[50] Or alternatively, this is termed "average product of labor" in Sector X.

Using a positive model, we now draw a positive conclusion from it. Steady-state solutions may be considered as long-term outcomes. What is observed from the results is that the income differences between rich and poor countries may be accounted for *largely* by the difference in their economic arrangements.

Under a well-accepted premise that the US has been on a balanced growth path for the past 2 centuries and that its institutions have not changed much, we calibrate the model to its stylized facts, assuming that *if* Thailand changed its "monopoly rights" arrangement into US-like competitive arrangement, its economy would look like the US's in a stylized sort of way in the long run. Therefore, steady-state competitive equilibrium may also be thought of as a good characterization of Thailand's long-run state of the world if it adopts a "free enterprise" arrangement.

The Thai economy has roughly attained a stable set of economic institutions post-1960s. This stability may be coming into question, but only in the present time. It is quite obvious that Thailand is not yet on a steady-state growth path in the same narrow sense that we apply to the US. From a positive and institutional angle, however, we may interpret steady-state monopoly rights equilibrium as where Thailand is today relative to 40 years ago. A bold positive conclusion might then be that if Thailand had adopted a freer economic arrangement since the inception of its modern economy, then its TFP level would have been higher today; in fact, it might have *almost* tripled by now.

The model demonstrates that the difference in economic arrangements can *approximately* account for current differences in TFP levels of Thailand and the US. It explains this difference by emphasizing the role of "monopoly rights" in Thailand's economy in deterring adoption of better technology and efficient usage of currently operating ones, thereby contributing to lower overall productivity and lower standard of living as measured by real GDP per capita.

If capital accumulation were to be incorporated into the model, the difference in GDPs at PPP between the two arrangements would be *exponential* because with the neoclassical production function that we use, the ratio of steady-state per-capita incomes under two arrangements is equal to the factor difference in TFPs raised to the power of $1/(1-\text{reproducible capital share})$; that is, TFP difference will then be $(3.07)^{1/(1-\text{reproducible capital share})} = (3.07)^{1/(1-0.6)} = 16.5$ times.[51]

If the income gap is to be closed and a poorer country be made rich, even while rich countries keep getting richer, then normative policy conclusion ought to be drawn. From a predictive standpoint, we imagine that the current arrangement is fixed from today onwards and study its steady state, which is a long-run approximation. Then, this long-run steady-state equilibrium is that of "monopoly rights" for Thailand in a stylized way. We find that our GDP at PPP and TFP level will be *at least* 3 times larger in the long run, if Thailand abolishes the inefficient monopolistic arrangement today.

Since Thailand's per capita GDP is 5 times lower than that of the US today and per capita income has been growing at roughly 2 per cent per annum in the US on its balanced growth path, simple arithmetic reveals that Thailand will never catch up with the US if it grows at the long-term average rate of lower than 2 per cent. What the model says is that should Thailand maintain the current "monopoly rights" arrangement,

[51] We estimate the reproducible capital share in Appendix B.

it shall *never* catch up, but staying at least 3 times below the US in per capita output in the long run. It is only logical to infer that Thailand will never grow at the long-term rate of higher than 2 per cent per annum in per capita terms if it persists with the current "monopoly rights" arrangement. With capital accumulation in the model and TFP differences exceeding 5, the rich-poor gap, instead of narrowing, may even widen.

An optimistic view looks as follows: Should Thailand adopt the "free enterprise" arrangement today, it can still catch up with the US. To get an idea how much time the catching up process will take, assume that Thailand can maintain the rate of per capita income growth at 5 per cent on average (its historical average), it will take 56 years to catch up with the US, assuming US average growth rate of 2 per cent. A more realistic 4 per cent average growth rate would translate into 83 years of catch-up time.

Conclusion

Our results clearly militate in favor of a transformation in Thailand's inefficient "monopoly rights" arrangement, as characterized by its regulatory regimes and tolerance of sub-par work practices, into that which minimizes the ability and incentive to deter better technology and work practices – the "free enterprise" arrangement adopted by most high-income, *century-old* modern economies.

Confronted by an entering firm armed with better technology, we record that the rational (i.e. per member income maximizing) coalition of factor suppliers in the model has no choice but to set their work practices at the best standard available to compete in every industry at the *threshold* of the entry/no entry decision by potential competitors. One could even argue that the same effect on work practices would materialize whenever entry threat prospects are credible. Alternatively, it can also be articulated that a reform of work practices will transpire once entry is imminent or occurring in sectors where regulatory barriers aiding status quo participants exist in today's Thailand.

The international income gap can be narrowed if both poor and rich countries strive for more open international markets, avoid protectionist tendencies, implement effective anti-trust policy, and deregulate industries in a way that creates a level playing field in order to promote competition. Physical capital accumulation, education, and skill acquisition will necessarily follow, as demand for them needs to be fulfilled.

Finally, governments in developing countries, particularly the Thai government, and major international agencies involved in economic development need to shift gear and pay more attention to theories that highlight productivity growth rather than factor accumulation *per se*. Overwhelming supporting evidence demands it from them.

References

Aghion, Philippe and Peter Howitt (1998). *Endogenous Growth Theory*, Cambridge, M.A., MIT Press.

Ahuja, Ashvin (2001). "Balanced Growth: Theory and Evidence from OECD Countries 1968-1996", Ph.D. Thesis, Department of Economics, University of Minnesota, M.N.

Aiemtham, Pornphirom (1984). "Phrai Nai Samai Ayutthaya", in Chatthip Nartsupha and Somphob Manarangsun eds., *Prawatsart Sethakit Thai Chon Thueng Phor Sor 2484*, Bangkok, Thammasat University Press.

Barro, Robert J. (1991). "Economic Growth in a Cross Section of Countries", *Quarterly Journal of Economics*, 106 (2), May, pp. 407-444.

Barro, Robert J., and Xavier Sala-i-Martin (1995). *Economic Growth*, New York, N.Y., McGraw-Hill.

Bils, Mark, and Peter J. Klenow (1996). "Does Schooling Cause Growth or the Other Way Around?", mimeo, University of Chicago Graduate School of Business, Chicago, I.L.

Blomstrom, Magnus, Robert Lipsey and M. Zejan (1996). "Is Fixed Investment the Key to Economic Growth?", *Quarterly Journal of Economics*, February, pp. 269-76.

Carroll, C.D., and D.N. Weil (1994). "Saving and Growth: A Reinterpretation", *Carnegie-Rochester Series on Public Policy*.

Christensen, Laurits R., Dianne Cummings, and Dale W. Jorgenson (1980). "Economic Growth, 1947-1973: An International Comparison", in John W. Kendrick and Beatrice Vaccara, eds., *New Development in Productivity Measurement and Analysis*, NBER Conference Report, Chicago, University of Chicago Press.

Clark, Gregory (1987). "Why Isn't the Whole World Developed? Lessons from the Cotton Mills." *Journal of Economic History*, 47 (1), March, pp.141-73.

Cooley, Thomas F. and Edward C. Prescott (1995). "Economic Growth and Business Cycles", in Thomas F. Cooley, ed., *Frontiers of Business Cycle Research*, Princeton N.J., Princeton University Press.

Cukierman, A., P. Kalaitzidakis, L.H. Summers, and S.B. Webb (1992). "Central Bank Independence, Growth, Investment, and Real Rates," Carnegie-Rochester Conference on Public Policy, November.

De Long, J.B. and L.H. Summers (1992). "Macroeconomic Policy and Long-Run Growth", *Federal Reserve Bank of Kansas City Economic Review*, 77 (4), pp. 5-30.

Easterly, William and Ross Levine (2000). "It's Not Factor Accumulation: Stylized Facts and Growth Models", The World Bank, November.

Elias, Victor J. (1990). *Sources of Growth: A Study of Seven Latin American Economies*, International Center for Economic Growth, C.A.

Fischer, Stanley (1993). "The Role of Macroeconomic Factors in Growth", NBER Working Paper No. 4565, National Bureau of Economic Research, Cambridge, Massachusetts, December.

Frisch, Ragnar (1933). "Editorial", *Econometrica*, 1, pp. 1-15.

Gallego, F. and N. Loayza (2001). "The Golden Period for Growth in Chile: Explanations and Forecasts", The Challenges of Economic Growth Conference, Central Bank of Chile, Santiago, Chile.

Gollin, Douglas (2002). "Getting Income Shares Right", *Journal of Political Economy*, 110 (2), pp. 458-474.

Grossman G. and E. Helpman (1991). "Quality Ladders in the Theory of Economic Growth", *Review of Economic Studies*, 58, pp. 43-61.

Hall, Robert E. and Charles I. Jones (1998). "Why Do Some Countries Produce So Much More Output per Workers than Others?", Manuscript, Stanford University, Palo Alto, C.A..

Hendricks, Lutz (2002). "How important is Human Capital for Development? Evidence from Immigrant Earnings", *American Economic Review*, 92 (1), March, pp. 198-219.

Jasso, Guillermina, Mark R. Rosenzweig, and James P. Smith (2000). "The Earnings of US Immigrants: Skill Transferability and Selectivity", Department of Economics, New York University, New York, N.Y.

Khan, M. S. and A. S. Senhadji (2000). Threshold Effects in the Relationship Between Inflation and Growth, IMF Working Paper, June.

Klenow, Peter J. (2001). "What have we learned from a decade of empirical research on growth?", *The World Bank Economic Review*, Vol. 15, No. 2, 221-224.

Klenow, Peter J. and Andres Rodriguez-Clare (1997). "The Neoclassical Revival In Growth Economics: Has It Gone Too Far?", *NBER Macroeconomics Annual 1*, National Bureau of Economic Research, Cambridge, M.A.

Kravis, Irving B., Alan Heston and Robert Summers (1982). *World Product and Income: International Comparisons of Real Gross Product*, Baltimore, Johns Hopkins University Press.

Kydland, Finn E., and Edward C. Prescott (1994). "The Computational Experiment: An Econometric Tool", Federal Reserve Bank of Minneapolis Research department Staff Report 178.

Lucas, Robert E. (1988). "On the Mechanics of Economic Development", *Journal of Monetary Economics*, 22, pp. 3-42.

McKinsey Global Institute (2001). *Prosperity through Productivity: A New Policy Agenda for Thai Economic Growth.*

Mankiw, N. Gregory, David Romer, and David N. Weil (1992). "A Contribution to the Empirics of Economic Growth", *Quarterly Journal of Economics*, 107 (2), May, pp.407-37.

Milesi-Ferretti, G.M. and A. Razin (1998). Current Account Reversals and Currency Crises: Empirical Regularities, IMF Working Paper, WP/98/89, June.

Mokyr, Joel (1990). *The Lever of Riches: Technological Creativity and Economic Progress*, New York, Oxford University Press.

Nartsupha, Chattip and Suthee Prasartset (1984). "Rabob Sethakit Thai phor Sor 2394-2453", in Chatthip Nartsupha and Somphob Manarangsun eds., *Prawatsart Sethakit Thai Chon Thueng Phor Sor 2484*, Bangkok, Thammasat University Press.

Parente, Stephen L., and Edward C. Prescott (1997). "Monopoly Rights: A Barrier to Riches", Federal Reserve Bank of Minneapolis Research Department Staff Report 236/JV.

Phongpaichit, Pasuk, Sungsidh Piriyarangsan and Nualnoi Treerat (1998). *Guns Girls Gambling Ganja: Thailand's Illegal Economy and Public Policy*, Silkworm Books, Chiang Mai, Thailand.

Prescott, Edward C. (1997). "Needed: A Theory of Total Factor Productivity", Federal Reserve Bank of Minneapolis Research Department Staff Report 242, December.

Romer, Paul M. (1986). "Increasing Returns and Long-Run Growth", *Journal of Political Economy*, 94, pp. 1002-37.

Sakkriangkrai, Sirilaksana (1984). "Rabob Sethakit Thai Samai Ayutthaya", in Chatthip Nartsupha and Somphob Manarangsun eds., *Prawatsart Sethakit Thai Chon Thueng Phor Sor 2484*, Bangkok, Thammasat University Press.

Sarel, Michael (1995). "Non-Linear Effects of Inflation on Economic Growth", IMF Working Paper WP/95/56, International Monetary Fund, Washington, D.C.

Summers, Robert and Alan Heston (1988). "A New Set of International Comparisons of Real Product and Price Levels: Estimates for 130 Countries, 1950-1985", *Review of Income and Wealth*, 34, pp. 1-25.

Tinakorn, Pranee and Chalongphob Sussangkarn (1998). *Total Factor Productivity Growth in Thailand: 1980-1995*, Thailand Development Research Institute, Thailand.

Weber, Max (1958). *The Protestant Ethic and the Spirit of Capitalism*, New York, Scribner's Press.

Wolcott, Susan (1994). "The Perils of Lifetime Employment Systems: Productivity Advance in the Indian and Japanese Textile Industries, 1920-1938", *Journal of Economic History*, 54 (2), June, pp. 307-24.

Young, Alwyn (1994). "Lessons from the East Asian NICs: A Contrarian View", *European Economic Review*, 38, pp. 964-973

Young, Alwyn (1995). "The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience", *Quarterly Journal of Economics*, 110 (3), pp. 641-680.

APPENDIX:

A) Derivation of Subgame-Perfect Equilibrium Conditions

To derive the necessary and sufficient conditions for a subgame perfect equilibrium, (14)-(18), backward induction is used. Before we proceed, two facts need be brought to attention. First, a necessary condition for maximizing income per coalition member in each industry i, which is the coalition's objective exercised through its choice of work practices $\pi_{x,i} \leq \pi_1$ and the wage rate $w_{x,i}$, is:

$$p_i \pi_{x,i} = w_{x,i}.$$

To see why, let's assume to the contrary. If $p_i \pi_{x,i} < w_{x,i}$, then not all members, identical in their membership, can be employed since firm's marginal revenue product is less than the wage rate or the marginal cost of hiring an extra worker. If $p_i \pi_{x,i} > w_{x,i}$, then the coalition has not maximized income per existing member since the wage rate can be increased since firms are still willing to hire an extra worker as he earns more revenue than his labor services cost. As members do not value leisure and $\pi_{x,i}$ is a choice variable, it can be assumed that the coalition will adjust $w_{x,i}$ and $\pi_{x,i}$ so that all members are employed at any given p_i.

Second, total demand for the differentiated good i, $D_i(p)$, is the sum over all households' and farm sector's demand and is price inelastic (since $\eta, \sigma < 0$). It can be obtained through household utility and farm sector profit maximization as follows. A type h household's demand can be obtained from (8) by using the no-entry steady state conditions that $p_i = p$, and $x_{h,i} = x_h, \forall i \in [0,1]$, to solve for $x_{h,i}$. The farm sector's demand can be obtained by setting p_i equal to the marginal product of $X_{a,i}$ using (3), with $X_{a,i'} = X_a, \forall i' \neq i$.

Backward induction, as the term suggests, implies that we start analyzing this game from the last stage and move on to the first.

Stage 3 of the game provides conditions (15)-(17). At this stage, the coalition in each industry i has determined $N_{x,i}$ and entry either has or has not occurred.

If there has *not* been entry, then industry i is populated by π_0 and π_1 technology firms. And industry i output is $X_i = \pi_{x,i} N_{x,i}$. Recall that demand for each differentiated good i is price inelastic, therefore the coalition of factor suppliers to industry i will maximize its total member compensation by setting its work practice, $\pi_{x,i}$, and wage rate, $w_{x,i}$, so that a firm using the π_0 technology just breaks even lest profit maximization by π_0 technology firms is violated (see argument above). This condition corresponds to (15).

In the only relevant case where each coalition in i is large enough to produce *total* quantity demanded at this price, i.e. when the coalition's capacity constraint is no less than total quantity demanded (i.e., with (15), $\pi_1 N_{x,i} \geq D(w_a / \pi_0)$), then income per coalition member is maximized when firms' profits equal zero or $p_i \cdot D_i(p) = w_x(N_{x,i}) \cdot N_{x,i}$. This condition and (15) jointly imply (16).

Work practices set by the coalition satisfies differentiated good i's market clearing condition in (17).

If there has been entry, then in the relevant cases where the entrant produces positive output, the entrant will choose to price its product at the level that maximizes its potential profit:

$$p(N_{x,i}) = \arg\max_p \left\{ \left(p - \frac{w_a}{\pi_2} \right) \left(D(p) - \pi_1 N_{x,i} \right) \right\}.$$

Notice that the coalition workers at existing π_1 technology firms will employ the best work practices available to maximize its per member income to minimize the entrant's profit.

In **Stage 2**, where entry has not occurred, but $N_{x,i}$ has been determined. Entering firms accurately foresee that existing π_1 technology firms will produce at its maximum $\pi_1 N_{x,i}$ units of output. Entry is deterred if

$$\max_p \left\{ \left(p - \frac{w_a}{\pi_2} \right) \left(D(p) - \pi_1 N_{x,i} \right) \right\} \leq w_a N \phi.$$

Entrant's profit decreases in $N_{x,i}$. Thus, there is a smallest $N_{x,i}$ that effectively deters entry. Let N_x denote that smallest entry-deterring coalition size.

The existence of the coalition and coalition size are determined in **Stage 1**. The continuation or cessation of coalition's life depends on whether income per member exceeds the farm wage rate. This implies the entry-deterrent condition (18).

B) Determining the Size of the "Informal Economy" and "Labor Share" in Thailand for use in the Model: A Brief Note

"Informal Economy": In determining a plausible size of the "informal economy," excluding illegal sectors, to be included in sector A for use in our calibration exercise for Thailand, we examine two sets of numbers. First, the sizes of the informal sector in the US and Germany are recorded at 27 per cent of GDP versus 60 per cent in Thailand (see Phongpaichit et al (1998)). Second, the US has far fewer people working outside of the official workforce (2 per cent) than Ghana, Bangladesh and Nigeria, where 75-80 per cent of manufacturing workers are self-employed, whereas the US's informal economy has been recorded at 27 per cent of GDP and that of Nigeria could be as large as GDP itself by some estimates.

We can make an educated guess on the size of the "informal economy" from these two sets of figures. We also examine Figure 3 in Gollin (2002) for his measurement of employers and own-account workers as share of total workforce across countries ranked by real per-capita GDP measured with purchasing power parity (Summers and Heston's Penn World Table) prices. What is reliably learnt from these data is that these shares are closely (*inversely*) related to real per capita GDP. Given that Thailand's real per capita GDP is recorded at US$3942 in the Summers and Heston's Penn World Table in 1992, which is the last year Summers and Heston provided their real GDP at PPP figures before the publication of Gollin (2002), the magnitude of the said share for Thailand could be placed at around 0.25-0.3 in 1992, as compared to 0.02 in the US. However, in contrast with this logical guesswork, Thailand's labor force data reveal that the share of employers and own-account workers averages narrowly around 0.58 from 1996-2001. This implies that since the approximate size of the informal economy depends very much on what share we use, and may range from 30 to a figure in excess of 60 per cent of official GDP.

Labor share of income: Income attributable to labor can be approximated from the Distribution of National Income Account using an analogous relationship as (22). That is, we let θ_L denote share of labor income in reported national income. Then, $\text{Labor Income} \equiv \theta_L \cdot (\text{Nat'l Income})$. We have

$$\text{Labor Income} = (\text{Unambiguous Labor Income}) + \theta_L \cdot (\text{Ambiguous Income}), \quad (23)$$

and,

$$\theta_L = \frac{(\text{Unambiguous Labor Income})}{(\text{Nat'l Income - Ambiguous Income})} \quad (24)$$

Let unambiguous labor income include only "compensation of employees", and incomes that can be *un*ambiguously attributable to other factors of production (e.g., capital and land) include "income from property", "savings of corporations and government enterprises", and "general government income from property and entrepreneurship". The rest of the items in this account we attribute to ambiguous income. Under this delineation, we obtain labor income share of 0.6 for 1995.[52] We find this estimate to be plausible.[53] This implies that if the residual share of income belongs to capital and land, then their total shares are 0.4 in total.

C) GDP at Purchasing Power Parity Prices (The Geary-Khamis Approach)

[52] Since factor shares of income do not vary much across time, we assume this figure to represent average labor share of income for Thailand.

[53] See Ahuja (2001), Cooley and Prescott (1995) and Gollin (2002) for more details on how to get factor shares of income correctly for developed countries and developing countries where own-account workers and self-employment may be large. Their results confirm ours that after adjusting labor income for the self-employed and other proprietors, on average, labor income shares vary from 0.6-0.8 in 31 countries across a wide spectrum of absolute incomes. Cooley and Prescott (1995) advocates including in capital income imputed incomes from consumer durables and government capital, thereby getting larger capital and smaller labor income shares than most estimates done elsewhere. Should we do the same, we would get higher capital share and lower labor share as a result.

In this section, we demonstrate how GDP at PPP in our computation experiment is obtained. More history and details on the approach on which this computation is based can be found in Kravis et al (1982).

Let $\overline{\Pi}_i$ and $\overline{\Gamma}_j$ denote the international price of category i of goods, and purchasing power parity of economy j, respectively. Then, in the context of our model economy, let $i \in \{A, X\}$ and $j \in \{M, F\}$, where M and F stand for "monopoly rights" and "free enterprise" economies, respectively. Let the M economy be our numeraire economy, i.e. $\text{PPP}_{ij} = p_{ij} / p_{i,M}$ and $Q_{ij} = \dfrac{p_{ij} \cdot q_{ij}}{p_{ij} / p_{i,M}} = p_{i,M} \cdot q_{ij}$.

Then, define

$$\overline{\Pi}_i = \sum_{j=M,F} \frac{\text{PPP}_{ij}}{\overline{\Gamma}_j} \cdot \frac{Q_{ij}}{\sum_{j=M,F} Q_{ij}}, \qquad i = A, X \qquad (*)$$

$$\overline{\Gamma}_j = \frac{\sum_{i=A,X} \text{PPP}_{ij} \cdot Q_{ij}}{\sum_{i=A,X} \overline{\Pi}_i \cdot Q_{ij}}, \qquad j = M, F \qquad (**)$$

Equations (*) and (**) carry a clear economic interpretation: (*) states that the international price of category i goods is the quantity-weighted average of the purchasing-power-adjusted prices of category i goods in both economies, M and F. (**) states that the purchasing power of an economy's currency is equal to the ratio of its total costs of goods at that economy's prices to the cost at international prices.

In our computation exercises, $PPP_{A,M} = \dfrac{p_{A,M}}{p_{A,M}} = 1$, $PPP_{X,M} = \dfrac{p_{X,M}}{p_{X,M}} = 1$, $PPP_{A,F} = \dfrac{p_{A,F}}{p_{A,M}} = \dfrac{1}{1} = 1$, and $PPP_{X,F} = \dfrac{p_{X,F}}{p_{X,M}} = \dfrac{\hat{p}}{p^M}$. Therefore, (*) and (**) can be rewritten as follows:

$$\overline{\Pi}_A = \frac{1}{PPP_M} \cdot \frac{A^M}{\left(A^M + \hat{A}\right)} + \frac{1}{PPP_F} \cdot \frac{\hat{A}}{\left(A^M + \hat{A}\right)} \qquad (C1)$$

$$\overline{\Pi}_X = \frac{1}{PPP_M} \cdot \frac{X^M}{\left(X^M + \hat{X}\right)} + \frac{\hat{p}/p^M}{PPP_F} \cdot \frac{\hat{X}}{\left(X^M + \hat{X}\right)} \qquad (C2)$$

$$\overline{\Gamma}_M = PPP_M = \frac{A^M + X^M}{\overline{\Pi}_A A^M + \overline{\Pi}_X X^M} \qquad (C3)$$

$$\overline{\Gamma}_F = PPP_F = \frac{\hat{A} + \left(\frac{\hat{p}}{p^M} \cdot \hat{X} \right)}{\overline{\Pi}_A \hat{A} + \overline{\Pi}_X \hat{X}} \qquad \text{(C4)}$$

Substituting all the known equilibrium prices and allocations solved earlier, and solve (C1)-(C4) simultaneously. We obtain, all in terms of $\overline{\Pi}_A$, the following: $\overline{\Pi}_X = 0.385 \cdot \overline{\Pi}_A$, $\overline{\Gamma}_F = 0.839 \cdot \overline{\Pi}_A$, and $\overline{\Gamma}_M = 1.548 \cdot \overline{\Pi}_A$. Moreover, with model economy's Y so defined as GDP, then $GDP_M = 0.746 \cdot \overline{\Pi}_A$ and $GDP_F = 2.287 \cdot \overline{\Pi}_A$, making the ratio of GDPs at PPP equal to $\frac{GDP_F}{GDP_M} = 3.07$.