

ON SOCIO-ECONOMIC ROLES AND SPECIALISATION

by

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Xiaokai Yang's theory of economic specialisation under increasing returns to scale is a formal development of the fundamental Smith–Young theorem on the extent of the market and the social division of labour. In this theory specialisation—and thus the social division of labour—is firmly embedded in a system of perfectly competitive markets. This leaves unresolved whether and how such development processes are possible in economies based on more primitive, non-market organisations.

In this paper we discuss a general relational model of economic interaction. Within this non-market environment we discuss the emergence of economic specialisation and eventually of economic trade and a social division of labour. We base our approach on three levels in organisational development: the presence of a stable relational structure; the presence of relational trust and subjective specialisation; and, finally, the emergence of objective specialisation through the institution and social recognition of economic roles.

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1 Introduction

Xiaokai Yang visited the Center for Economic Research at Tilburg University during the Spring of 1999. Immediately he engaged two of the three authors in extensive discussions on his research programme. We readily identified similar research interests and this led to fruitful exchanges and discussions.

During Professor Yang's visit to Tilburg we in particular discussed working paper versions of papers that were published subsequently as Diamantaras, Gilles and Ruys (2003), and Sun, Yang, and Zhou (2004). These papers address some of the central

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^{*} This paper is dedicated to the memory of Xiaokai Yang, whose work on specialisation and the social division of labour inspired us in constructing the theory that is presented and discussed in this paper. This paper is an extended compilation of the formal theory developed in Gilles, Lazarova and Ruys (2006).

problems and theoretical questions that lie at the intersection of our respective research programmes. It is therefore fitting that in this paper we return to these central questions and sketch a new theory of the emergence of a social division of labour in a non-market economy.

Professor Yang's research programme was initially enunciated in Yang (1988) and subsequently brought to fruition in numerous research papers.¹ The core of this research programme is the application of inframarginal analysis to the decision model of an individual consumer–producer within a system of perfectly competitive markets. Yang's inframarginal approach is in turn used to model the Smith–Young approach to the relationship of specialisation, the social division of labour, and increasing returns to scale, in line with Smith (1776), Young (1928), and Stigler (1951).

In his seminal work *The Wealth of Nations*, Adam Smith (1776) argued that the social division of labour is limited by the extent of the market, so that the benefits of specialisation to an individual are determined largely by the existing social division of labour in the economy. This principle is also known as the *Smithian Theorem*. Young (1928) extended the Smithian Theorem into a synergetic argument that the extent of the market also depends on the level of social division of labour. Thus, the presence of increasing returns leads to specialisation and further social division of labour. In turn, a high level of social division of labour within a system of competitive markets leads to the deepening of increasing returns to scale and eventually to increasing economies of specialisation. These developments form further incentives to specialise and develop the social division of labour.

In the present paper we shall sketch an argument that extends the Smithian Theorem beyond the setting of an economy based on a system of perfectly competitive markets. Our argument is that the Smith–Young mechanism also applies to social organisations and institutional settings other than that of a system of perfectly competitive markets. In particular, we develop a theory based on value-generating binary relationships—or 'matchings'—that describe the relational foundation of all economic interaction. This describes a primitive economy in which markets, at best, exist in their most primitive form, namely as a network of binary exchange relations—without necessarily the presence of a single price that determines the terms of trade in marketable exchange relationships.

We conclude from our analysis that the process of specialisation occurs at different levels of embeddedness of the individual consumer–producer within the relational structure of the economy. Only at its most advanced state—namely that of objective specialisation—does this process result in a social division of labour. A social division of labour thus generates economic development and growth in the context of more primitive economic institutions and exchange mechanisms. This leads to the conclusion that a social division of labour can emerge *independently* from a system of perfectly competitive markets. The Smith–Young mechanism is in fact founded on more fundamental forces within the economy. Hence, economic development is *not* based on the endogenous selection of a specialisation by an individual based on the prevailing market prices; instead, it is the institutionalisation of a pair of complementary social economic roles—from which the individual selects one—that generates growth. Each

¹ We refer to Yang (2001), Yang (2003), and Cheng and Yang (2004) for a comprehensive review of the work that has been accomplished in this research programme.

role corresponds to some objectively-defined specialisation of that individual. For a detailed development of the mathematical model, see Gilles, Lazarova and Ruys (2006) on which the current paper is based.

In their seminal contribution, Yang and Borland (1991) showed theoretically that the Smith–Young mechanism functions as a determining factor for economic growth. Indeed, the mechanism of ever-deepening economic specialisation and the accompanying development of the social division of labour lead to significant growth. In economic history and the new institutional economics this has been accepted as the main engine underpinning the rise of the Western economies.²

Recently, Acemoglu *et al.* (2005) have confirmed Yang and Borland’s theoretical conjecture through empirical observations and analysis. Furthermore, Ogilvie (2004) and Greif (2006) have extended this institutional growth argument and have pointed to economic organisations other than the perfectly competitive market in which the Smith–Young mechanism leads to economic development and growth. Acemoglu *et al.* (2005) mainly point to the development of property rights and the underlying political institutions as causes of economic growth, while Ogilvie (2004) investigates the development of mediaeval and early-modern guild systems. Empirical evidence of past performance of Western economies supports these arguments. Our theoretical contribution is congruent with this line of research.

In Section 2 we develop our model of a matching economy, based on binary value-generating activities among economic agents. We also discuss subjective specialisation and the possibility of subjective stability through means of an existence result. In Section 3 we define generic stability as our main equilibrium notion and present our main existence result. This result identifies the possibility of objective specialisation, which in turn implies the emergence of a social division of labour in such a matching economy. We summarise and extend our main line of thought in Section 4.

2 Trust and Stability

As mentioned above, in the current paper we discuss a model of a rather primitive economy in which economic agents interact with one other directly without reference to a central organisation such as a system of competitive markets or a unified price mechanism. Instead, individual economic agents engage in binary, value-generating relationships or ‘matchings’. These matchings have to be understood as binary productive engagements, which are not necessarily trade relationships. It is assumed in this very primitive economy that every individual activates exactly one value-generating matching.

Our main argument is that there are two different forms of stability possible within such a matching economy.

- *Subjective stability*: Individuals engage in binary, value-generating relationships—so-called matchings—and stability is attained if individuals are not willing either to break all their engagements and become autarkic or switch partners for higher benefits. Thus, there results a stable matching pattern based on the *local* properties of these binary engagements. In other words, the stability is ‘subjective’

² See, e.g., North and Thomas (1973), North (1990), Greif (1994), and North (2005).

in the sense that it is completely based on the properties of the productive abilities and utility functions of the individuals in the economy.

We show that the presence of stable matching patterns is guaranteed in the case that a special substructure of potential relationships has a bipartite structure. The existence of subjectively stable matching patterns is the subject of our first existence theorem.

If a state of subjective stability is attained, individuals may develop mutually beneficial trade within the relationship that they are already engaged in. Subsequently, after beneficial trade has been established, the engaged individuals may specialise their productive activities. This specialisation occurs only within the (subjective) setting of the matching that they are engaged in. We call this *subjective specialisation*.

We emphasise that subjective specialisation does *not* induce a social division of labour, since individuals are not engaged at a higher social plane. Their economic interaction is explicitly limited and confined to their matchings only. In that regard, the organisation of the economy remains scattered and it has no unified social organisation. Consequently, there are no widespread gains from trade but only locally generated gains.

- *Generic stability*: Only if generic stability is possible can economic agents truly specialise in an objective fashion and social division of labour emerges. A matching economy attains generic stability if for *every profile* of utility functions and production sets, there exists a stable matching pattern. Our main existence theorem states that such generic stability is attained if and only if there is a social organisation of the economy based on at least two socially recognised economic roles. Hence, there should be at least two complementary socio-economic roles such that value-generating relationships exist solely between individuals with different socio-economic roles. Only after such complementary socio-economic roles are established, can a true endogenous social division of labour emerge, in which individuals specialise in these roles. In turn, this implies that a social organisation of the economy emerges and that widespread gains from trade become attainable.

Our main existence theorem on generic stability thus shows that a bipartite social division of labour is a pre-requisite for stability. This amends the Smithian theorem in the sense that there has to be a finite set of socio-economic roles, in which individuals can specialise, for there to be stability in the economy's social organisation. The emergence of a set of socially recognised socio-economic roles is thus a necessary condition for stability in the economy.

Since economic prosperity is determined largely by the set of available complementary socio-economic roles, the Smith–Young mechanism of economic development is now linked to the development of this set of socially recognised roles; innovation in social organisation—in the sense that new social roles are developed—now determines the extent of the market and, thus, economic growth.

Although our model of a matching economy describes a very primitive society, we believe that it can lead to some rather deep conclusions. Our approach also makes explicit the indeterminacy problem identified by Gilles and Diamantaras (2005). They argued that the theory of the Smith–Young development mechanism within the context

of a well-developed system of perfectly competitive markets is founded on a circular argument: prices of traded goods determine individuals' specialisation, and thus prices determine the social division of labour. This, in turn, determines which goods are produced and traded, determining the extent of the market. This brings up the question of who or what ultimately determines which goods are traded and how economic development is accomplished. In other words, this development mechanism has no origin or starting point. Gilles and Diamantaras concluded that the determinacy problem has to be resolved in order to make further progress on the analysis of the processes of economic development. Our goal in our analysis is to show that stability is required for any specialisation of individuals in an economy and that a social division of labour only emerges in a society that has a stable organisational structure based on objectively given socio-economic roles. In this section we discuss the first part of this argument. We introduce a generic model of a society in which individuals can engage in binary economic interactions. We define two stability concepts in such a relational economy and determine when stability is attainable.

In a sense this determinacy problem is placed at the centre of our analysis in our approach. Indeed, our main result states that generic stability requires the existence of a set of established social roles from among which individuals can choose when they specialise. Each socio-economic role 'stands for' a certain commonly recognised economic specialisation and, when in equilibrium, the number of agents of each role is balanced.³ Only then does an effective social division of labour emerge and the society can engage in an effective process of economic development and growth. Ultimately, economic development is thus founded on the enhancement and extension of the socially determined set of accepted economic roles.

We conclude that economic development and growth are caused by organisational and institutional changes rather than technical change only.⁴ We argue that technical change is a *consequence* and *expression* of the effectiveness of the social organisation of the economy.

2.1 Matching Economies and Stable Matching Patterns

Formally, we denote a finite set of *individuals* by $N = \{1, \dots, n\}$. At this stage we do not make any assumptions about these individuals regarding their individual abilities. Hence, at this stage we do not explicitly assume that these individuals are even able to specialise in any form. Instead, we endow these individuals with the abilities to engage into relational economic activities that generate economic values or wealth.⁵ We refer to these binary interactions as value-generating (economic) relational activities. Thus, individuals are assumed to have *relational* economic abilities. We do not exclude that these relational abilities in turn might be based on individual abilities. We do not assume or impose that these value-generating relational activities take place in the

³ For the latter argument we refer to Yang's theory of general equilibrium under endogenous specialisation. Explicitly we refer to Yang (2001) for a detailed discussion and treatment of this argument.

⁴ We refer again to Acemoglu *et al.* (2005) for a complete discussion of this point of view.

⁵ The most primitive form of a matching is that of cooperation in some production activities. More advanced forms include the simple exchange or *trade* of two commodities. The gains from trade then form the values that are generated between the two traders.

context of a market. Instead we assume that these relational abilities describe the economy itself.

Formally, we define $\Gamma \subset \{ij \mid i, j \in N\}$ as a set of potential relational activities between the individuals in N . Here, for two distinct individuals $i \in N$ and $j \in N$ with $i \neq j$, we define $ij \in \Gamma$ to mean that these individuals, i and j , are able to engage in a value-generating relational activity. We indicate this potential relational engagement $ij \in \Gamma$ as a *potential matching* of i and j .

Furthermore, every individual $i \in N$ is endowed with complete and transitive preferences over his or her potential matchings $L_i(\Gamma) = \{ij \in \Gamma \mid j \in N\} \subset \Gamma$ in which he or she can engage. These preferences can be represented by a *hedonic utility function* given by $u_i : L_i(\Gamma) \rightarrow \mathfrak{R}$. Let $u = (u_1, \dots, u_n)$ denote a *hedonic utility profile* and let U be the set of all hedonic profiles representing complete and transitive preferences. We summarise the developed primitive concepts into a unifying concept as follows:

Definition 1

*A **matching economy** is defined to be a triple $E = (N, \Gamma, u)$ in which N is a finite set of individuals, Γ is a potential matching structure on N , and $u \in \dot{U}$ is a hedonic utility profile on Γ . The pair (N, Γ) consisting of the set of individuals endowed with all potential value-generating relationships is also called the **(relational) constitution** of $E = (N, \Gamma, u)$.*

A matching economy is essentially based on potential binary activities that generate economic values. For example, a trade economy can be represented as a matching economy between buyers and sellers who trade physical goods to generate gains from trade. Hence Γ represents the binary trade relations between such buyers and sellers. The gains from trade are exactly the hedonic utilities generated in these trade relationships. That is, $u_i(ij)$ stands for the individual gains from trade of individual i as he or she engages in a mutually beneficial trade with individual j .

Within the context of a matching economy we investigate the proper definition of stability. Stability refers to the presence of a pattern of activated matchings that is in a state of equilibrium. Stability is a necessary condition for the further development of an economy, in particular for the emergence of specialisation and a social division of labour.

Our main hypothesis in the definition of stability is that in a matching economy $E = (N, \Gamma, u)$ each individual i activates *exactly one* of his or her potential matchings in $L_i(\Gamma)$. This fundamental hypothesis is founded on the fact that we model a very primitive economy without the presence of advanced economic or social institutions. In such a primitive economy it is natural to assume that individuals only interact with one other individual at a time and that more complex interactions require more advanced social institutions than are assumed in our context.

Formally, we introduce the notion of a matching pattern to describe a collection of activated binary value-generating relationships in Γ .

Definition 2

A **matching pattern** is a subset of the potential matching structure $\pi \subset \Gamma$ such that every individual is either paired with exactly one other individual or remains relationally autarkic, i.e., $\pi \subset \Gamma$ is such that either $|L_i(\pi)|=1$ or $ii \in \pi$, for all $i \in N$.

In a matching pattern, one and only one matching is selected and executed by each individual. For ease of notation we denote the utility an individual i has when participating in a matching pattern π in which $L_i(\pi) = \{ii_\pi\}$ as $u_i(\pi)$, i.e., $u_i(\pi) \equiv u_i(ii_\pi)$, for all $i \in N$. We emphasise that the hedonic utility profile considered here allows an individual to consider only one matching at a time, since we do not allow an individual to engage in multiple matchings at one and the same time.

With the tools developed so far we are able to introduce two relational stability concepts. Again we let the matching economy $E = (N, \Gamma, u)$ be given throughout. For matching pattern $\pi \in \Pi$, a potential matching $ij \in \Gamma \setminus \pi$ is a **blocking matching** if $u_i(ij) > u_i(\pi)$ as well as $u_j(ij) > u_j(\pi)$.

Having defined a blocking matching as a *strict* binary Pareto improvement, we follow the concepts used in the literature on matching (Roth and Sotomayor, 1990). We point out that our notion of stability is closely related to that of stability in network formation (Jackson and Wolinsky, 1996). Using this concept, we can define our stability property of a matching pattern.

Definition 3

A matching pattern $\pi \in \Pi$ is **stable** in the economy $E = (N, \Gamma, u)$ if all matchings in π satisfy the **individual rationality (IR)** and the **no blocking (NB)** conditions:

- **IR** $u_i(\pi) \geq u_i(ii)$ for all $i \in N$, and
- **NB** there is no blocking matching with regard to π , that is, for all $i \in N$ and $j \in N$ with $i \neq j$ and $ij \in \Gamma \setminus \pi$ it holds that $u_i(ij) > u_i(\pi)$ implies that $u_j(ij) \leq u_j(\pi)$. Stable matching patterns in E are denoted by $\pi \in \Pi^*(N, \Gamma, u)$.

Condition **IR** is an individual rationality requirement, which states that an individual cannot be matched with another individual without his or her consent, i.e., if an individual is better off under relational autarky, he or she will pursue that course of action.

Condition **NB** stands for a non-blocking condition requiring that a blocking matching does not exist with respect to the matching pattern $\pi \in \Pi$. Under **NB**, if an individual prefers to be matched with some other individual than the one with whom he or she is matched under matching pattern π , then that alternative individual does not agree to engage with him (or her). This condition is closely related to the condition of link addition 'proofness' in network formation. Link addition proofness lies at the foundation of the notion of pairwise stability in network formation, introduced by Jackson and Wolinsky (1996).

With reference to the definition of stable matching patterns, we note that in general these stable patterns may fail to exist. In particular, in the absence of such a stable

matching pattern there emerges a state of chaos or instability within a relational economy E . This essentially refers to a situation in which individuals are permanently searching for the optimal partner to engage in a value-generating relationship.

The main application of the general relational framework developed here is that of a relational economy of consumer-producers. We point to the new classical framework developed in Yang (2001) and Yang (2003). The new classical approach is founded on the premise that consumer-producers specialise within a social context of a structure of (market) interactions and thereby attain higher welfare.

In Gilles *et al.* (2006) we started at an even more primitive level of reasoning. Before there is actual specialisation, there are consumer-producers with simple *skills* on which specialisations can be based. We recognise that skills, unlike commodities, are intrinsic to a consumer-producer and cannot be exchanged. They can, however, be shared. Sharing one's skills with another individual is a process that does not make the giver any poorer in the skill.⁶ As established by Yang and Borland (1991) and Yang (2003), learning-by-doing is an important mechanism in the process of economic growth. However, in Yang's framework this process is individual-specific, i.e. economic individuals are not 'allowed' to learn from each other. In Gilles *et al.* (2006), we go beyond this restriction by considering the possibility of learning processes among engaged individuals.

2.2 Existence of Stability and Subjective Specialisation

In our previous discussion, we have focused mainly on a primitive economy with limited specialisation. In such economies equilibrium may not emerge in the form of a stable matching pattern. (For an explicit example of such an economy we refer to Example 3.4 in Gilles *et al.* (2006).) Here we investigate the sufficient conditions for the existence of such stable matching patterns. We also discuss the implications of our findings with regard to specialisation in a relational economy.

We first address the introduction of a particular sub-structure of the constitution of a matching economy.

Definition 4

A matching pattern $\pi \in \Pi$ is **weakly stable** in the economy $E = (N, \Gamma, u)$ if all matchings in π satisfy the individual rationality (**IR**) and whenever a blocking matching $ij \in \Gamma \setminus \pi$ exists, at least one of the blocking partners in ij is relationally autarkic, i.e., $\{ii, jj\} \cap \pi \neq \emptyset$.

Denote by $\Pi_w \subset \Pi$ the collection of all weakly stable matching patterns.

Finally, we define $\Gamma_w = \cup \Pi_w \subset \Gamma$ to be the set of all potential weakly stable matchings.

The definition introduces a sub-constitution (N, Γ_w) based on the class of weakly stable matching patterns. We refer to the sub-constitution (N, Γ_w) as the *core-constitution* of the matching economy $E = (N, \Gamma, u)$.

⁶ By comparison, a commodity, if shared, makes the giver poorer with respect to the possession of that commodity. This is to say that while commodities are pure private goods, skills are non-rival in nature.

For the formulation of our existence theorem, we introduce some auxiliary concepts. Let $\Omega \subset \Gamma$ be a collection of mutually beneficial relationships between individuals in N . The sub-constitution (N, Ω) is *bipartite* if there exists a partitioning $\{N_1, N_2\}$ of the set of individuals N such that

$$\Omega \subset \{ij \mid i \in N_1 \text{ and } j \in N_2\} \cup \{ii \mid i \in N\}.$$

Hence, in a bipartite constitution of a relational economy, there are two socially recognised economic roles or “types” such that value-generating relationships only exist between individuals of different types.

Existence Theorem 1

If a matching economy $E = (N, \Gamma, u)$ has a bipartite core-constitution (N, Γ_w) , then it holds that $\Pi^(N, \Gamma, u) \neq \emptyset$.*

This theorem identifies a particular set of potential value-generating relationships that has to form a bipartite structure in order for stable matching patterns to be possible. Hence, certain vital or ‘constituting’ relationships have to form a bipartite structure. This implies that there are essentially two groups of individuals between which these constituting relationships exist. We again refer to Gilles *et al.* (2006) for further discussion of this topic and its consequences.

3 Specialisation and Stability

In the previous section we introduced various notions of stability—or equilibrium—and linked the existence of stable matching patterns to the bipartite nature of certain vital value-generating relationships. In this section, we link the existence of these stable matching patterns to the possibility of individual specialisation.

3.1 The Emergence of Exchange and Subjective Specialisation

Let us assume that we have a matching economy, E , that satisfies the condition of Existence Theorem 1. That is, E has a bipartite core-constitution. In that case there emerges a state of subjective stability in the sense that there exists a stable matching pattern in the economy. We emphasise that subjective stability is based on the local conditions in the economy, i.e., the explicit abilities of the individuals in that economy, rather than the generic, global conditions in the economy.

If a subjectively stable state emerges in the economy, all individuals are engaged in stable value-generating relationships. Within the context of these relationships, a moderate level of relational *trust* can build up. If a sufficient high level of trust emerges, commodity exchanges between these individuals will occur. Thus, the emergence of a level of moderate relational trust allows individuals to engage in mutually beneficial exchange of commodities. We emphasise that this commodity exchange is purely binary and is thus scattered at best. Therefore, there is neither any market nor any global trade network emerging.

After mutually beneficial commodity exchange has been established, enhancing the value-generating relationships in which individuals are engaged, a further deepening of the level of relational trust will take place. After the relational trust has been enhanced, individuals will trust their partners sufficiently for them to become willing to specialise in their productive activities. We emphasise that this form of specialisation is based on local conditions in the economy, and in particular on the conditions of the relationships in which individuals are engaged. Indeed, if conditions are favourable, individuals may develop sufficient trust towards their partner such that they decide to specialise fully and exchange their necessary commodities with their likewise fully specialised partner. This can be called *subjective specialisation*.

Gilles *et al.* (2006) develop a detailed example in which these specialisation processes are made explicit and higher levels of wealth or hedonic utility are achieved through specialisation and binary exchange. Again we emphasise that under subjective specialisation a global social organisation in the form of a system of markets and a social division of labour does not emerge. Instead, individuals remain engaged in binary relationships guided by conditions in their immediate neighbourhood, i.e., by local conditions in the economy only.

3.2 *The Emergence of Trade and Objective Specialisation*

The previous discussion clarifies the emergence of stable matching patterns and of subjective specialisation. This emergence is essentially based on localised conditions that are based on features *within* the subjectively stable pattern of stable matchings. For an economy to have persistent access to such gains from specialisation, the social structure of the economy has to admit stable matchings *generically*. Hence, whatever the capabilities and desires of the individuals—represented by their utility functions and (possibly) other individualistic features—a stable matching pattern has to exist in the matching economy.

Technically, this brings up the question under which conditions on (N, Γ) there exists a stable matching pattern for *every* possible matching economy $E = (N, \Gamma, u)$, where u is an arbitrary utility profile. This line of research follows the research agenda set in the literature on matching. Here we are able to apply the main result of Papai (2004).

Definition 5

*A relational constitution (N, Γ) is **generically stable** if for every utility profile $u \in U$ —and thus for every matching economy $E = (N, \Gamma, u)$ based on this relational constitution—it holds that $\Pi^*(N, \Gamma, u) \neq \emptyset$.*

Our main existence theorem can now be stated as follows:

Existence Theorem 2

The relational constitution (N, Γ) is generically stable if and only if (N, Γ) is bipartite.

This second existence theorem provides a complete and powerful characterisation of generically stable matching structures. This is a strong result, with some deep consequences. As stated before, certain sets of skill complementarities might result in the emergence of stable matching patterns. These stable matching patterns in turn give rise to subjective specialisation and mutually beneficial exchange. This does not mean that there are necessarily widespread gains from trade. For such enhanced economic development it is necessary that an objective or socially recognised division of labour emerges.

In particular, the deepening of the stable matching patterns through subjective specialisation in turn leads to the emergence of bipartite structures of potential matchings. This emergence is based on the social recognition of the roles that are based on the subjective specialisation of individuals in such stable matching patterns. This is discussed next.

In objective specialisation each individual now expects to be trading when he or she engages in a matching. Also, under objective specialisation, unlike under subjective specialisation, the level of trust expands to the whole set of players, that is to the whole economy. This is why an individual firmly believes that he or she can be matched with another player with whom exchange is beneficial in a stable matching. In fact, there is *common knowledge* that individuals with different socially recognised specialisations can be matched in highly productive value-generating relationships. Individuals who assume social roles have socially justified beliefs that a stable matching pattern exists.

At present we argue that further deepening of the efficiency in this economy is only possible through the establishment of a true social division of labour based on a set of socially recognised economic roles. For that purpose we consider a primitive society in which individuals acquire two different productive skill: hunting skills and gathering skills. Assume that at first there emerges some stable matching pattern in which individuals exploit the complementarities of hunting and gathering. Within the context of this equilibrium, individuals now decide to become slightly specialised in either hunting or gathering. If sufficient trust is developed among matched individuals, some individuals may specialise fully in hunting or in gathering. This introduces subjective specialisation into this primitive economy, similar to the social developments discussed at the end of Section 3.1.

Subsequently, a deepening of this specialisation may emerge. Indeed, if these subjective specialisations are socially recognised, individuals become a 'hunter' or a 'gatherer'. Being a hunter now becomes a socially recognised economic role, as does being a gatherer. This in turn implies that only after the establishment of such complementary social roles does a *social division of labour* emerge.⁷ The emergence of socially recognised economic roles and the accompanying social division of labour is now identified with the effects of full-blown economic specialisation. This type of specialisation is generic in the sense of Definition 5 above; it can be referred to as *objective specialisation*.

⁷ We emphasise here that the establishment of a social role requires the recognition of each role in the society and that this implies the separation of the related specialism from the individual. Thus, the social recognition of an economic role induces a dichotomy of this role and other aspects of his or her life for every individual that assumes this role. Productive activities are separated from consumptive activities for each individual, justifying a neo-classical approach.

It should be noted here that the emergence of trade between individuals with different social roles is fundamentally different from commodity exchange between subjectively-specialised individuals. Social recognition alleviates the informational burden and brings about certain expectations.

Finally, we can identify the conditions under which a competitive market can emerge. If a sufficiently large number of individuals assume the social roles of hunter and gatherer and other economic institutions such as the protection of property rights, monetary instruments, and if the creation of actual market places are established, then a market may emerge in which hunters and gatherers can trade vegetables and meat for a well established and specific market price.

Objective specialisation excludes relationships between individuals with the same social role as being potentially beneficial economic matchings. This implicitly reduces the potential matching structure to an odd acyclic or bipartite structure in which only matchings between individuals with two different roles are recognised.

4 From Chaos to Generic Stability and Market Systems

Thus far in this paper we have introduced a four-stage approach to the emergence of a social division of labour based on the objective specialisation of individuals. As a fifth stage we can add the emergence of market institutions themselves. This approach clarifies the principle that the presence of a social division of labour is in fact a prerequisite for the creation or emergence of a functioning price mechanism. Summarising these four stages are:

Stage I: Chaos (non-equilibrium). In a primitive relational economy without objective specialisation, there are usually conditions that prevent the emergence of an equilibrium. This leads to a situation in which all individuals are fully autarkic and in which there is a state of permanent relational chaos. Individuals are fully self-reliant for the provision of necessities for survival. Consequently, the generated level of welfare is that of pure subsistence. Any additional utility generated through interpersonal spillovers from social interaction are purely additional benefits to the generically low subsistence levels.

Stage II: Primitive equilibrium. Within a primitive relational economy there might exist conditions that allow the emergence of a stable social interaction pattern. Such a stable pattern is only founded on subjective and personal features, not on any objective or social conditions. Within this stage we distinguish two sub-stages.

(II-A) Initially there only emerges a stable pattern in which interpersonal spillovers are exploited. This first level of stable social interaction facilitates the emergence of a moderate level of subjective trust among the matched individuals.

(II-B) Next, the emergence of sufficient subjective trust among the individuals that are engaging with one another supports the introduction of exchange among those individuals; the exploitation of interpersonal spillovers is then extended into the exchange of economic commodities leading to further increases in the

levels of utilities. The emergence of exchange is an important step into the development of an economy.

Stage III: Subjective specialisation. After exchange has been established, there is the possibility for a further deepening of interpersonal trust within the stable relationships in the economy. This facilitates the emergence of subjective specialisation in which individuals—based on the demands of their interpersonal relationships—specialise their economic activities. Hence, within the context of a stable exchange relationship with another individual, a person selects a production plan to optimise his utility level based on the resulting consumption plan.

This process of subjective specialisation is similar to the specialisation process based on inframarginal analysis developed by Yang—as a formalisation of the Smith–Young development mechanism—within the context of a perfectly competitive price mechanism. However, subjective specialisation does *not* take place within the context of a functioning price mechanism, but rather within the interpersonal relational setting of each individual separately.

Stage IV: Objective specialisation. The emergence of subjectively specialised individuals can lead to the recognition of socio-economic roles in the society at large. Hence, individuals specialising subjectively on certain skills within the context of their individual value-generating relationships, become socially recognised as occupying a ‘profession’ that relates to this specific skill-set. Thus professionals are identified in the society as occupying a certain socio-economic role. This corresponds to an *objectification* of the specialisation of that individual: the individual assumes an objectively defined and socially recognised economic role.

Subsequently, there emerge social rules related to these socio-economic roles. Returning to our illustrative example of a hunter-gatherer society, the engagement of a socially recognised ‘hunter’ with a socially recognised ‘gatherer’ in an economically beneficial (exchange) relationship thus becomes the foundation for economic development. Individuals subsequently specialise in an objective fashion: they now select from a given set of socio-economic roles and engage in an objective fashion with other individuals in their respective social roles to generate mutual economic benefits.

It is only within this context of objective specialisation that there emerges a *social division of labour*, which further development acts as an engine for economic growth—described in the context of a market by the Smith-Young mechanism.

Stage V: Market emergence. We argue that a functioning market or price mechanism can emerge only after the establishment of social division of labour based on the social recognition of certain economic roles. Besides the social division of labour other economic institutions also have to be established. Only after these other conditions are met can a price mechanism emerge through which further economic growth and development are made possible in the form of the Smith–Young mechanism based on the extent of the market.

In this paper we have only developed the most basic principles of a descriptive theory. The main conclusion is that economic development and growth are closely related to the objective development of an extended set of socio-economic roles in a society. These social roles have an objective, *public* nature, and as such should be subject to a purely public economic theoretical analysis or an evolutionary treatment. This is closely related to the conclusion of Gilles and Diamantaras (2005).

Further development of this abstract theory of matching economies is required before we can expect a full working understanding of the five-stage process of market development summarised above. This is left to future research.

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