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Efficiency with Rule-Compliance: A Contribution to the Theory of the Firm in Islamic Economics

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Abstract. The theory of the firm and the profit maximization have been important areas of debate among Islamic economists as being fore bearers of applicability of conventional economic theory in the Islamic economics. One strand of the debate holds the view that the postulate of profit maximization, as a useful theoretical construct, has to be modified for a firm operating in an Islamic economy, while the other strand highlights that Islamic economy has its own normative rules with an underlying institutional scaffolding derived from the Qur'an and Sunnah. Following the second view, this paper is a modest contribution to the debate by demonstrating that once an institutional scaffolding containing the rules of behavior compliant with the Qur'an and Sunnah is in place, the profit maximization postulate becomes a useful concept in Islamic economic theory. The paper also shows that allocation efficiency with equity is possible provided that the firm is rule-compliant, even in case of a monopoly.
Keywords. Allocative efficiency, Firm theory, Profit maximization, Profit sharing, Islamic economics.
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1. Introduction

Islamic finance has drawn a lion's share of theattention of Muslim economists over the last three decades. Nevertheless, some important contributions have been made to other issues in macro and micro economics. In the latter area, theory of the firm in general and the profit maximization postulate in particular have been the focus of debate as flag bearers of applicability of conventional economic theory in Islamic economics. Thus far, two views have emerged from the debate. Majority view holds that the postulate is a useful theoretical construct but has to be modified before it is applicable to a firm operating in an Islamic system.[1] The minority view, on the other hand, argues that the theory of firm and the postulate of profit maximization is applicable to an Islamic economy provided that the normative structure, derived from the Qur'an and Sunnah, is in place.

The first view was initially articulated by Metwally (1992) who modified the profit maximizing objective by introducing "*charity*" as an additional argument of the objective function.[2] A number of papers advocating the first view followed

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Metwally (1992) by maximizing a utility function for the entrepreneur which included various additional elements as arguments of the objective function (Azid, Asutay, & Khawaja, 2008; Yusof & Amin, 2007). A clear position that emerges out of the last three decades of debate on this issue is that of Azid, Asutay, & Khawaja (2008), who, after a succinct review of various contributions to the debate, suggest that "…we cannot tame markets with the cane of legislation. Hence, firms cannot be forced to act morally in such a market. We need to transform the market into an ethicized market by means of endogenizing the moral elements in all socioeconomic menus, preferences, institutions and interactions". In other words, if the rules, or institutional structure, of behavior are internalized, i.e., the normative structure is in place, the positive theory can and do serve useful purposes. What is encouraging about the contributions of scholars to the theory of firm behavior in an Islamic setting is their willingness to address contemporary challenges based on their own direct understanding of the rules of behavior prescribed by the Qur'an and Sunnah enriched by the writings and ideas of scholars of generations past.[3]

Early contributions by Al-Junaid (1992) and Iqbal (1992) are the best articulations of the second view, which has two components.[4]The first component argues that an Islamic economy operates on the basis of rules that constitute its institutionaland its normative structure (Al-Junaid, 1992; Iqbal, 1992; Mirakhor & Askari, 2010; Mirakhor & Hamid, 2009; Mirakhor, 2009). Once these are in place, positive theories of firm behavior, among other theoretical constructs, can yield valuable insights as guide to policy. The second component argues that the profit maximization postulate is an efficiency criterion and, as such, it is applicable to an Islamic economy, provided that the normative structure represented by the institutional framework, derived from the Qur'an and Sunnah, is in place (Al-Junaid, 1992; Iqbal, 1992). In his various papers, Hasan (1983; 1992; 2011) has focused on these two aspects of the postulate by arguing that the postulate, despite its shortcomings, particularly on empirical ground, is still "needed in Islamic economics, as well" (Hasan, 1992) and, that the profit maximization, along with other postulates of neoclassical economics, finds applicability in Islamic economics as "these postulates have also to be the fulcrum of the new discipline for its survival" (Hasan, 2011). Moreover, he asserts that "the profit maximization postulate is of global connotation, and has for that reason more and wider expository and predictive powers. Also, it admirably helps explain adjustments between the changes occurringwithin and between markets" (Hasan, 2002).

In the light of the second view, this paper focuses on those contributions to the theory of firm in an Islamic context that rely on [Islamic] rules of economic behavior in light of their authors' understanding of the Qur'an and Sunnah (Al-Junaid, 1992; Azid et al., 2008; Bendjilali & Taher, 1990; Hasan, 1983; 1992; 2002; 2011; Iqbal, 1986; 1992; Sugema, Bakhtiar, & Effendi, 2010). Among these, Hasan (1992), Bendjilali & Taher (1990) and Sugema, Bakhtiar, & Effendi (2010) explicitly model firm behavior in an Islamic context.[5] It can be argued that compliance with the rules prescribed by the Qur'an and Sunnah will ensure that in the long run there is no excess profit as a firm in an Islamic economy is perceived "as a cooperative-competitive organization" (Azid et al., 2008).

The term "cooperative" derives from the direct imperative of the Qur'an that command cooperation while "competitive" derives from the necessity of efficiency in use of resources and their preservation (Azid et al., 2008).[6] It is argued that conditions specified for markets in an Islamic economy yield results thatmimic those of perfect competition (Islahi, 1982; 1985). If that is the case, then straight forward application of profit maximization leads to allocative efficiency, at least in the long run. In the short run, however, technological progress, innovations,

location and other factors can, and often do, result in excess profit. Bendjiali & Tahir (1990) address the question of whether in an Islamic economy the operations of a rule-compliant firm with monopoly power result in loss of efficiency in resource allocation. Their answer is that it need not.[7] This paper is intended to make a modest contribution to the ongoing debate by suggesting that: (i) profit maximization as an efficiency criterion is useful in an Islamic economy, (ii) that this need not mean a sacrifice of equity, and (iii) that these assertions hold even if there are market imperfections. In the conventional economic theory, more often than not, it is thought that there is a trade-off between equity and efficiency. Market imperfections, it is argued, exacerbates the trade-off. While it can be demonstrated that in a rule-compliant Islamic economy, without market imperfections, both efficiency and equity are achieved, this note addresses a more challenging issue. Following Bendjiali & Tahir (1990), the paper demonstrates that even in case of a monopoly, allocation efficiency with equity is possible provided that the monopolist is rule-compliant.

2. Debates on the Postulate of Profit Maximization

After explaining what maximization of profit means in the mainstream economic theory, Hasan (2011) argues that while this postulate has been criticized much even within conventional economics, it continues to survive because: (i) without it the process of price formation in different markets and under different conditions would be difficult to explain, and (ii) no other theoretical construct has been offered as its replacement having the same degree of explanatory and predictive power. He goes on to suggest that Shari'ah alternatives offered by Islamic economists, such as "fair profit" are unworkable and asserts that, due to its limitations, "a fair profit notion in theory and practice take us back to the maximization of profit issue". If there are to be normative modifications of profit maximization, they should be introduced into the external environment of the firm by "public policy" (Hasan, 2011). Profit maximization itself is "value neutral" and "it is a powerful tool for economic analysis; it moves market to equilibrium. It can be and is used with legal provision to safeguard against potentially undesirable consequences. Shari'ah provides ample protection to both consumers and the hired factors of production against profit seeking at their cost. Islamic economics need not throw away the baby with the bath water..." (Hasan, 2011).

Hasan (2011) asserts that theoretical constructs such as profit maximization "constitute minimal tools needed to explain and investigate economic phenomena to help formulate theories with predictive ability needed to guide economy policy". Criticism of the postulate by Islamic economists, e argues, is due to "misconceptions" by them and their detractors. Both are engaged in "misplaced argumentation" by being "oblivious to simple principle of logic that one must compare the ideals of his system with the ideals – not realities – of the other. Islamic economists invariably err in comparing the ideals of their system based on what ought to be with what is of capitalism in operation" (Hasan, 2011). Similarly, the critics of Islamic economics"attack Islamic ideals for erecting an economic system as having failed citing the conditions as they are in the present day Muslim countries" (Hasan, 2011).

One of these"misconceptions" is the apparent confusion between "profit maximization" and "seeking maximum profits". They are two different concepts. The former is a technical efficiency criterion referring to resource allocation and distribution. It is based on a set of logical propositions and is derived from the Fundamental Theorems of Welfare Economics. The latter, however, is a conjecture relating to the presumed "greedy" and "avaricious" behavior of capitalists. It is a

conjecture that is not anchored on a set of logical propositions discernible from the discussions ofthis topic in the Islamic economics literature. Most of the writings, generally, make conjectural modifications in the, basically, neoclassical maximization models (Amin & Yusof, 2003; Yusof & Amin, 2007)

Subjectively modifying theoretical constructs through simple conjectures that are not anchored on a set of logical propositions leads to "misconceptions". This is, perhaps, the reason for Hasan's (2011) appeal that "Islamic economists can contribute to the effort by eschewing subjectivity coloring their thought process...". This paper is a modest response to this appeal in its attempt to demonstrate the validity of the position advocated by Al-Junaid (1992), Iqbal (1992) and Hasan (2011) that once an institutional scaffolding containing the rules of behavior compliant with the Qur'an and Sunnah is in place, the profit maximization postulate becomes useful, in Islamic economic theorizing.

In a thought experiment, Hasan (2011) asks the reader to "suppose one had a magic wand that could be used for making competition perfect in all sorts of markets – the ideal of capitalism. Then, one could presumably venture the demonstration that much of the divergence between the ideal Islamic economic structure and that of capitalistic order evaporated into thin air". Whether such demonstration of convergence of the "ideal" Islamic system and capitalism is possible is an open question. Nevertheless, there has been an important class of literature specifying appropriate binding rules for function of markets in an Islamic economy that, while predating development of conventional economics by centuries, resemble those defined for perfect competition. For example, Islahi (1982; 1985) writing on the "economic concepts" of Ibn Taymiyyah suggests that the latter, based on his understanding of the Qur'an and Sunnah, "had at least some of the conditions of perfect competition in mind" when expressing his views on the functioning of the market and "had a clear conception of a well-behaved, orderly market, in which knowledge, honesty and fair play, and freedom of choice were the essential elements".[8] The implication is that if there is rule compliance in the economy, then results similar to those achieved in the ideal model of perfectly competitive economy will be obtained. Specifically, this means that there would be no excess profits. While such results could be demonstrated, it is perhaps more challenging to show that even in case of a strong non-competitive form of market imperfection, i.e. monopoly, allocative efficiency and equity obtain provided that the institutional structure representing operationalized rules of economic behavior, as prescribed by the Qur'an and Sunnah, are in place in the economy. The only additional objective requirement that need enter the theoretical construction is profit-sharing as suggested, for example, by Hasan (1992) and by Sugema, et.al. (2010).

In the Islamic economics literature relating to the theory of the firm, one encounters an implicit assumption that the operations and forms of firms in an Islamic economy would look much the same as those in the capitalist system except that their objective function is modified somewhat. This assumption has not been examined critically. In conventional economics in the late 1930s, Coase (1937) began to raise a concern that economic theory had never defined a "firm". Coase's (1937) paper was all but ignored until the 1960. Since then much has been written expounding and expanding his work leading to the transaction cost theory of the firm. Other theories of the firm, such as contract theory or the property rights theory of the firm, have also been developed since the 1970s.[9] These theories are ex-post explanations for the form and substance of "firms" in market capitalism. The economic system of market capitalism and the forms of business organizations that developed within it are historical phenomena. There has never been an ex-ante theory for either. Even today, there is no uncontested theory to explain why market

capitalism traversed the unique historical trajectory that resulted in its present configuration. While it is possible to find elements common to an Islamic economic system and market capitalism, given the differences in their initial positions and in rules governing economic behavior, it would seem important to investigate the likelihood that had the Islamic economy stayed rule compliant after the Prophet Muhammed (pbuh), the trajectory of its development would have yielded the same configuration as that of contemporary market capitalism.

There are at least two ways by which such a study could be undertaken. One way would be to specify clearly the rules that govern economic behavior and the actual functioning of the market at the time of the Prophet Muhammed (pbuh) and then investigate the historical deviation from the archetype system established by him in Medina to determine how far the system deviated from its archetype model and whether the accumulated deviations were significant enough to allow the emergence of the contemporary configuration of economies in Muslim countries. To an extent, this is the approach adopted by Chapra (2010). The other is to specify the rules and investigate the resulting economic system and the functioning of its market and the firms within it. The related literature in Islamic economics follows the second approach. Regardless of which approach is adopted, it would be useful to investigate whether the known binding constraints such as the existence and operation of rules – such as justice, sharing, reciprocity, cooperation, redistributive mechanisms, rules governing production and consumption, inheritance laws, property rights and others – would lead to same system as market capitalism.[10] Some of these institutions exist in market capitalism others do not. For example, concern with equity, a fundamental objective of an Islamic system, is a relatively new phenomenon in contemporary market capitalism as is the recognition of the need for government intervention to correct market failure.

In conventional economics it was not until the 1970s when concerns with economic and social justice found its clear theoretical expression and gained the attention of economists[11]. To date, however, no operational propositions have resulted from the justice criteria developed in the substantial and growing literature on socio-economic justice. In Islam, however, the criterion of justice and conditions under which it obtains are ex-ante, simple and operational. The criterion contains two principles each of which can be stated as the corollary of the other. The first is: positioning all things in their rightful place (وضع الأمور في مواضعها الحقة) and, the second principle is: giving each their rightful due (إعطاء كل ذي حق حقه). Both conditions would be met and justice obtained if and when the economy and its participants become compliant with rules prescribed by the Qur'an and the Sunnah. It is perhaps the second principle that prompts Hasan (1992; 2011), Sugema, et.al. (2010) and others to suggest that applied to firm's behavior it would mean justice is served when each factor of production receives the value of its marginal product. This objective, these scholars suggest, is best achieved through profit sharing. This proposition will be employed in this paper to derive a sharing rule that potentially can ensure both allocative efficiency and equity as understood from the second principle of justice.

Principle of profit sharing has attracted attention in the conventional theory of the firm since the 1960s.[12] Much of this literature deals with the question of how to best elicit maximum productivity from labor given that, it is argued, hired labor on fixed wages has an incentive to shirk from working. A good part of this literature, therefore, is focused on the search for "incentive-compatible" labor contracts. Some form of profit sharing, in addition to fixed wages, is incorporated in the theories of "incentive-compatibility". Because "it is the separation of ownership and labor that creates the characteristic motivation problem of the capitalist enterprise", profit sharing "will be incentive compatible" (Kroszner & Putterman,

2009). The theoretical research of the 1980s and 1990s on this issue reached the conclusion "that the problem of eliciting effort from workers may be fundamentally transformed by profit sharing" (Putterman, 1993). The theory suggested, moreover, that a possible incentive-compatible contract would be a linear combination of fixed wages and a share of the profit of the firm (Berhold, 1971; Weitzman & Kruse, 1990; Weitzman, 1984; 1986).

Importantly, empirical research on actual profit-sharing arrangements in place in market capitalism suggests that there are favorable incentive effects that accrue to firms that implement these arrangements. It is thought that one reason for this improved productivity response of workers to profit sharing is workers' mutual monitoring efforts to ensure that shirking is minimized. This is unlike the indifference to other workers' productivity effort that permeates non-profit-sharing arrangements.[13] It appears that a linear combination of wages and profit share is what Hasan has in mind when he asserts that the absence of an interest rate mechanism "and profit sharing with labor" in an Islamic economy "may lead to several consequences promotive of growth and distributive justice" (Hasan, 1992). He suggests that "Islam would prefer the whole value product minus depreciation and a minimum maintenance wage as profit to be shared between labor and capital on some agreed equitable basis" (Hasan, 1992). It can be shown that, even with market imperfections assumed in models suggested by Hasan (1992) and by Bendjiali & Taher (1990) allocative efficiency with equity is possible without the necessity of adding anything, like a minimum wage, to the neoclassical profit maximization other than requiring that profit is shared in toto between labor and capital.

As noted earlier, an Islamic economy is a rules-based system defined by an institutional structure – a network of rules of behavior – that characterizes the system. These rules are enunciated in the Qur'an and operationalized by the Prophet Muhammed (pbuh) during his lifetime, especially during the period he served as the temporal authority in Medinah. It was during this latter period when He established a market for Muslims and operationalized the rules governing market behavior. These rules have been identified and explained elsewhere and will not be repeated here.[14] Among these rules are those specified for market participants. It is argued that compliance with these rules results in efficient and equitable outcome (Ahmad, 1982; Hasan, 2002; 2011; Siddiqi, 2002). In particular, production will be efficient because it is subject to the binding rules[15] that induce economizing in producer behavior (in addition to the usual cost-saving behavior that is part and parcel of theory of the firm). Furthermore, equity will be obtained because the principle of justice requires each factor to receive the full value of its contribution to production, andprofit-sharing arrangement ensures that excess profit is shared between factors of production. This would imply that efficiency and equity criteria require that the firm operate on its production function, that marginal rate of substitution among factor inputs equal the ratio of their prices, and that there be no excess profit in a rule-compliant market. A compelling case can be made that this efficiency-equity result is a logical consequence of rule compliance that leads to perfectly competitive conditions being satisfied. However, a more interesting case would be to demonstrate these results in the case where there is market imperfection assumed by Bendjiali & Taher (1990).

3. Theoretical Construct

Realistically, even in a fully rule-compliant economy, existence of factors that can lead to monopoly power such as technological progress, innovation, economies of scale, external economies (location and economics of agglomeration) among

others - cannot be ruled out. The question is: how will a rule-compliant firm withmonopoly power behave to ensure that both allocative efficiency and equity criteria are satisfied. The following theoretical construct is intended to provide a tentative answer to this question by assuming that a firm produces an output (Q) with two inputs, labor (L) and capital (K). It hires labor at the wage rate (w) prevailing in the rule-compliant market. It raises capital through ex-ante (before production and sale of output) profit-loss-sharing arrangement. The funds thus raised and the amount of capital purchased with these funds give the price per unit of capital (r). Being rule compliant regarding distribution, the firm knows that all profits must be distributed among factor inputs, including entrepreneurial effort subsumed under one or the other inputs.

There are three possible cases during the post-production and sale of output: (a)Profits are exhausted by payments to inputs as agreed in the pre-production phase, i.e. $\pi = wL + rK$, where π is the profit of the firm; or (b) there are losses, i.e. $\pi < wL + rK$, in this case the loss is shared among the equity holders based on pre-production profit and loss sharing arrangements; or (c) there are excess profits, i.e. $\pi > wL + rK$. The focus of this paper is on the latter case, as the other two pose no particular challenge. Specifically, the paper asks: is there a rule which the firm can follow in distributing excess profits that ensures allocative efficiency and equity. It is envisioned that there are two sets of factor prices $r$and w in the pre-production and sale phase and $\hat{r}$and $\hat{w}$in the post-production and sale phase, respectively. The production function of the firm is assumed to be $Q = f(L,K)$[16]. The firm's demand function is given by $p = P(Q)$ and its revenue function (concave) is $R(Q) = P(Q)Q$. Its cost function is $C(L,K) = wL + rK$. The firm's profit function is thus: $\pi(Q,L,K) = P(Q)Q - (wL + rK)$. While the firm is committed to distribute all profits among factor inputs, capital (equity) has a prior claim arising from pre-production profit-loss-sharing arrangement. Therefore, if there is any excess profit, capital has a prior claim to a share. The firm then operates under the constraint that:

$$P(Q)Q - \hat{w}L - rK \leq 0 \qquad (1)$$

In the pre-production phase, the funds available to the firm to pay labor is$P(Q)Q - rK$. However, if there are excess profits, the firm, based on its commitment to the rule of justice, knows that a share must be allotted to labor, thus ensuring that$\hat{w} > w$. Hence, the firm has an additional constraint that:

$$P(Q)Q - rK \leq \hat{w}L \qquad (2)$$

Subtracting wL from both side of this constraint and taking all terms to the left-hand side yields

$$\pi(Q,L.K) - (\hat{w} - w)L \leq 0 \qquad (3)$$

The allocative efficiency issue arises because distributing more than a fair share to either input tilts resource allocation in favor of that input in violation of justice and no waste rule, i.e. more of that input will be used than necessary. What is needed is a distribution rule that ensures justice and allocative efficiency; that the right amount of inputs are used in production. To search for such a rule the following problem can be formulated.

$$maximize\pi(Q, L.K) = P(Q)Q - (rK + wL) \quad (4)$$

Subject to the constraints that:

$$Q - f(L, K) \leq 0 \quad (5)$$

$$\pi(Q, L.K) - (\hat{r} - r)K \leq 0 \quad (6)$$

$$\pi(Q, L.K) - (\hat{w} - w)L \leq 0 \quad (7)$$

With this formulation, the constrained optimization problem can be solved to arrive at simple rules governing the distribution. As is demonstrated in the Appendix, the rule requires

$$\frac{\hat{r}}{r} = \frac{\hat{w}}{w} \quad (8)$$

meaning that so long as the firm distributes profits such that this equation is satisfied equity and allocative efficiency are ensured.

4. Conclusion

This paper has been an attempt to make a modest contribution to the ongoing debate about the efficacy and the extent of usefulness of the profit maximization postulate in the nascent development of theory of the firm in Islamic economics. The paper has considered two positions prevalent in the debate. One suggests that an economy in Islam would be a rules-based system. The rules are prescribed in the Qur'an and operationalized by the Prophet Muhammed (pbuh). These rules constitute the institutional scaffolding for the operation of the economy. Among these are rules governing the behavior of market participants. Whereas in market capitalism the market is considered as constituting the system, in an Islamic economy it is a mechanism among others, albeit a crucially important one, to achieve the economic objectives of the society. Hence, this view suggests that in an Islamic economy, assumption of compliance with the rules and their internalizations by participants prior to market entry, plus regulation and supervision of the market itself, would make it possible to use the profit maximization postulate as an efficiency criterion to gain insights into the question of how firms would behave in such a system. The other view, while not rejecting the usefulness of the postulate altogether, suggests various modifications before applying it to determine firm behavior in an Islamic economy.

A number of scholars assert that in a rule-compliant Islamic economy, markets display characteristics that mimic the results obtained under conditions of perfectly competitive markets. If so, profit maximization postulate can be applied directly to determine necessary and sufficient conditions for allocative efficiency. It is argued that the distribution rule under these conditions requires that each factor receives the value of its marginal product, a result that converges to the concept derived from the Islamic principle of justice that each factor of production receives its just due. A more interesting question than the one posed under conditions similar to perfect competition is raised by Benjiali & Taher (1990). They ask whether there is any loss of efficiency if markets are not perfect. Specifically, they consider the case of monopoly operating in an Islamic economy. They demonstrate that, in a specific formulation of this problem, there need not be efficiency loss. This paper formulates the monopoly question in a setting different from that of Benjiali and Taher(1990). It shows that by requiring profit sharing among factors of production, it is possible to obtain a simple distribution rule that achieves allocative efficiency

with equity. It is perhaps worth noting that the procedure suggested here can be utilized to investigate the results of introducing other market imperfections.

Appendix

Given the formulation earlier, the Lagrangian is formed as:

$$H(Q,L.K,\lambda_1,\lambda_2,\lambda_3) = (1-\lambda_2-\lambda_3)\pi(Q,L.K) - \lambda_1[\mathrm{Q} - f(L,K)] + \lambda_2(\hat{r}-r)K + \lambda_3(\hat{w}-w)L \quad \text{(A1)}$$

The Kuhn-Tucker necessary – also sufficient due to the assumption of the concavity of revenue function – conditions are derived as[17]:

$$\frac{\partial H}{\partial Q} = (1-\lambda_2-\lambda_3)\frac{\partial \pi}{\partial Q} - \lambda_1 = (1-\lambda_2-\lambda_3)MR - \lambda_1 \leq 0 \quad \text{(A2)}$$

$$\frac{\partial H}{\partial K} = (1-\lambda_2-\lambda_3)\frac{\partial \pi}{\partial K} + \lambda_1\frac{\partial f}{\partial K} + \lambda_2(\hat{r}-r) = -(1-\lambda_2-\lambda_3)r + \lambda_1\frac{\partial f}{\partial K} + \lambda_2(\hat{r}-r) \leq 0 \quad \text{(A3)}$$

$$\frac{\partial H}{\partial L} = (1-\lambda_2-\lambda_3)\frac{\partial \pi}{\partial L} + \lambda_1\frac{\partial f}{\partial L} + \lambda_3(\hat{w}-w) = -(1-\lambda_2-\lambda_3)w + \lambda_1\frac{\partial f}{\partial L} + \lambda_3(\hat{w}-w) \leq 0 \quad \text{(A4)}$$

$$\frac{\partial H}{\partial K}K = [(1-\lambda_2-\lambda_3)MR - \lambda_1]Q = 0 \quad \text{(A5)}$$

where MR is marginal revenue.

$$\frac{\partial H}{\partial K}L = \left[-(1-\lambda_2-\lambda_3)w + \lambda_1\frac{\partial f}{\partial L} + \lambda_3(\hat{w}-w)\right]L = 0 \quad \text{(A6)}$$

where $Q, L, K \geq 0$.

$$\frac{\partial H}{\partial \lambda_1} = -Q + f(L,K) \geq 0 \quad \text{(A7)}$$

$$\frac{\partial H}{\partial \lambda_2} = -\pi(Q,L.K) + (\hat{r}-r)\mathrm{K} \geq 0 \quad \text{(A8)}$$

$$\frac{\partial H}{\partial \lambda_3} = -\pi(Q,L.K) + (\hat{w}-w)\mathrm{L} \geq 0 \quad \text{(A9)}$$

$$\frac{\partial H}{\partial \lambda_1} = -\lambda_1[Q - f(L,K)] = 0 \quad \text{(A10)}$$

$$\frac{\partial H}{\partial \lambda_2} = -\lambda_2[\pi(Q,L.K) + (\hat{r}-r)\mathrm{K}] = 0 \quad \text{(A11)}$$

$$\frac{\partial H}{\partial \lambda_3} = -\lambda_3[\pi(Q,L.K) + (\hat{w}-w)\mathrm{L}] = 0 \quad \text{(A12)}$$

where $\lambda_1, \lambda_2, \lambda_3 \geq 0$.

Noting that under the production assumptions $\lambda_i \geq 0$, $Q, L, K > 0$ and by resorting to complementary slackness conditions, the above Kuhn-Tucker conditions may be reduced to the following three necessary and sufficient conditions for a maximum:

$$(1-\lambda_2-\lambda_3)MR - \lambda_1 = 0 \quad \text{(A13)}$$

$$\lambda_1\frac{\partial f}{\partial K} = (1-\lambda_3)r - \lambda_2\hat{r} \quad \text{(A14)}$$

$$\lambda_1 \frac{\partial f}{\partial L} = (1-\lambda_2)w - \lambda_3 \hat{w} \quad \text{(A15)}$$

Consistency with the basic production theory requires that the last two terms must be positive, i.e.

$$\lambda_1 \frac{\partial f}{\partial K} = (1-\lambda_3)r - \lambda_2 \hat{r} > 0 \quad \text{(A16)}$$

$$\lambda_1 \frac{\partial f}{\partial L} = (1-\lambda_2)w - \lambda_3 \hat{w} > 0 \quad \text{(A17)}$$

Invoking the implicit functions theorem, the marginal rate of substitution of the two factor inputs for the firm under consideration becomes

$$-\frac{\partial L}{\partial K} = \frac{\lambda_1 \frac{\partial f}{\partial K}}{\lambda_1 \frac{\partial f}{\partial L}} = \frac{(1-\lambda_3)r - \lambda_2 \hat{r}}{(1-\lambda_2)w - \lambda_3 \hat{w}} \quad \text{(A18)}$$

Recalling that the firm is rule compliant and observes the rule of no-waste as well as that of just distribution, the firm must then operate on its production function and not bias the distribution of post-production and sale excess profits in favor of either input. This would mean that (A8) and (A9) are strict equalities, i.e.,

$$\frac{\partial H}{\partial \lambda_2} = -\pi(Q, L.K) + (\hat{r} - r)\mathrm{K} > 0 \quad \text{(A8')}$$

$$\frac{\partial H}{\partial \lambda_3} = -\pi(Q, L.K) + (\hat{w} - w)\mathrm{L} > 0 \quad \text{(A9')}$$

Further manipulation of (A8') and (A9') yields:

$$\frac{L}{K} = \frac{\hat{r} - r}{\hat{w} - w} \quad \text{(A19)}$$

The efficiency condition where there are no monopoly profits is given as:

$$MRS_{KL} = \frac{r}{w} \quad \text{(A20)}$$

An efficiency ratio can be constructed between the two marginal rates of factor substitution with and without excess profits,

$$\frac{\frac{(1-\lambda_3)r - \lambda_2 \hat{r}}{(1-\lambda_2)w - \lambda_3 \hat{w}}}{\frac{r}{w}} = \frac{(1-\lambda_3)r - \lambda_2 \hat{r}}{(1-\lambda_2)w - \lambda_3 \hat{w}} \cdot \frac{w}{r} = \frac{MRS_{KL}\ with\ excess\ profit}{MRS_{KL}\ without\ excess\ profit} \quad \text{(A21)}$$

It can be argued plausibly that the above efficiency ratio must be strictly equal to one for efficiency to prevail in the excess profit case. If the ratio is greater or less than one, resources are misallocated in favor of one or the other factor of production. The above efficiency ratio can be signified and set equal to one yield,

$$\lambda_2 \left(\frac{\hat{r}}{r} - 1\right) = \lambda_3 \left(\frac{\hat{w}}{w} - 1\right) \quad \text{(A22)}$$

since the firm operates on its production function, $\lambda_2 = \lambda_3$ and (A22) is reduced to

$$\frac{\hat{r}}{r} = \frac{\hat{w}}{w} \quad \text{(A23)}$$

which provides a simple distribution of excess profit rule that ensures allocative efficiency. The rule requires that the firm set $\hat{r}$to satisfy (A23). It is worth noting that substitution of (A19) in (A22), the efficiency multipliers, and manipulating yields:

$$wL = rK \quad \text{(A24)}$$

that is equality of factor shares also ensure allocative efficiency.

Notes

[1] For a survey of these positions, see (Yusof & Amin, 2007).

[2] See Iqbal (1992) for a succinct criticism of this modified form.

[3] See (Yusof & Amin, 2007). There is a trend among some, however, to adopt uncritically and wholesale the thoughts of scholars of centuries past to address contemporary problems. An example is the full adoption of and application to, *inter alia*, firm and consumer behavior the theory of "*Shari'ah objectives*" developed centuries ago. A compelling argument can be made that this theory, first developed by scholars such as Imam Al-HaramainJuwayni, later adopted and refined by scholars such as Ghazali and Shatibi, was a response of scholars of early and middle ages of Islam to the problems and challenges of their time and their environment. Al-HaramainJuwayni, for example, developed his views to assist the population of new Muslims outside of the Arabian Peninsula who were not familiar with the Qur'an and Sunnah. The view on "*Shair'ah objectives*" was developed to guide these societies. The ideas developed by scholars such as Al-Haramain Juwayni on the "*Shari'ah objectives*" were firmly based on their understanding of the Qur'an and Sunnah, as well as, on their perception of the dynamics of the societies they lived in, as well as, on the received knowledge. By the time scholars such as Ghazali and Shatibi arrived on the scene, the dynamics of the society had changed as had its challenges. For example, Ghazali had to face challenges posed by intellectually more aware society that had access to a treasure trove of translated philosophical works of Greek, Indian, Roman, Persian and other thoughts. Muslim philosophers such as Al-Kindi, Al-Farabi, Ikhwanus Safu, Ibn Sina and Ibn Rushd had developed an impressive corpos of Islamic philosophy in light of the Qur'an and Sunnah (Mirakhor, 2003). The strength and influence of these intellectual achievements in developing critical thought were such that, in the minds of conservative scholars, created a threat to the "*pristine*" Islamic message. Ghazali's response was an all-out attack, in defense of the purity of Islamic thought, against what he saw as serious deviations introduced by philosophy, philosophers, Zandaqa and Zandeeqs. Ibn Rushd's valiant counter-attack notwithstanding, Ghazali's thoughts, including his understanding of "*Shari'ah objectives*", won the day, lionized, and adopted officially thus overshadowing any other understanding that could have stimulated a different trajectory of intellectual progress. It is significant that Ghazali himself based nearly all of his writings on his understanding of the Qur'an and Sunnah as well as his perception of challenges of his own time and environment rather than uncritical adoption of received thought. This applies not only to his writings on philosophy but in all dimensions of social problems as well including economics. Instructive is, for example, his arguments on the prohibition of Riba, debasing of currency, rules of market behavior, among others. Criticisms of earlier scholars, their thoughts and their applicability to contemporary socio-economic problems are not the intention here. Rather, it is the wholesale and uncritical adoption of them that is at issue. Uncritical and unmodified adoption of solutions offered long ago to problems defined by a different time and environment would appear to need a strong assumption that the internal and external dynamics of contemporary society and thought are the same as those of centuries ago. It also sends a signal of the paucity of thought and weakness of the intellectual ability of today's Muslims to develop ideas and solutions in response to contemporary challenges and problems of humanity in light of their own understanding of the Qur'an and Sunnah as was done by the scholars of the middle ages of Islam. Both the assumption and the signal run counter to the reality of applicability of the two primary sources of Islamic thought as well as to the demonstrated strength of the intellectual capabilities of contemporary Muslims. The Qur'an is taken axiomatically to be applicable to all times and in all environments. So is the Sunnah of the Messenger (sawaws) that expounds, interprets and operationalizes the rules prescribed by Allah s.w.t. Scholars of each generation need to apply these two primary sources to solve the problems of humanity of their time and environment. Of course, the thoughts of earlier generations must be studied exhaustively, diligently but critically for any guidance they can provide.

[4] See also the comments on Al-Junaid (1992) paper by Ayubur Rehman Bhuyan in (Ahmad & Awan, 1992). Iqbal's (1992) unequivocal position is lucidly expressed in his presentation.

[5] In Bendjilali & Taher (1990) model, there is, however, no explicit production function. Also, in Hasan's (1992) model there is no derivation of rules of profit sharing between capital and labor.

[6] For a more detailed discussion see Ahmad (1982), Siddiqi (2002), Islahi (1985), and Khan & Mirakhor (1989).

[7] Bendjiali & Tahir (1990) assume that the Muslim entrepreneur maximizes utility as a function of profit and social welfare. They assume social welfare is "*a function of the firm's output*" but social welfare does not enter into the utility function in a functional form but directly as output. Since profits, as the other argument of the utility function is also dependent on output, utility becomes a function of output.

[8] See also Siddiqi (2002), Ahmad (1982) and Chapra (2010).

[9] See Penrose (1958); Alchian & Demsetz (1972); Demsetz (1967; 1982; 1983); Jensen & Meckling (1976; 1977; 1979); Hart (1989); Bowles (1985); Bowles & Gintis (1993a; 1993b); Malmgren

(1961); Ross (1973; 1974); Williamson (1964; 1967; 1979; 1985; 1994); Williamson & Winter (1991); Furubotn (2001); Furubotn & Pejovich (1972); Cheung (1969; 1983); Chandler (1977); Fama (1978; 1980); Fama & Jensen (1983a; 1983b).

[10] See Cizakca (2011) for a comprehensive historical analysis.

[11] See, for example, Rawls (1971); Nozick (1974); Buchanan (1984); Sen (2009).

[12] See Alchian & Demsetz (1972); Nalbantian (1987); Milgrom & Roberts (1988; 1990; 1992); Berhold (1971); Blinder (1990); Weitzman & Kruse (1990); Baker, et.al. (1988); Itoh (1989); Holmstrom & Tirole (1989); Holmstrom (1982); Holmstrom & Milgrom (1991); Kruse (1988); MacLeod (1988); Neuberger (1973); Putterman (1988; 1993); Weitzman (1984; 1986); Haque & Mirakhor (1986).

[13] See Weitzman (1984; 1986); Weitzman & Kruse (1990); Baker, et.al. (1988); for discussions of mutual monitoring and related incentives see Macleod (1988); Dong (1991); Dong & Dow (1993); Bradley & Gelb (1981); Fitzroy & Kraft (1986).

[14] See Islahi (1982); Siddiqi (2002); Ahmad (1982); Hasan (1992; 2002; 2011); Mirakhor & Hamid (2009); Mirakhor & Askari (2010); Azid, et al. (2008).

[15] Such as no waste (Israf), no destruction (Itlaf), and no opulence (Itraf). Note that these binding rules modify the conventional notion of "economic efficiency". Price of a product plays an important role in the conventional conception of "economic efficiency". While this would also find application in a theory of the firm in an Islamic economy, practical implementation subject to the binding rules of no waste, no destruction, and no opulence render the results different in the two systems. For example, a dairy farmer in the conventional system may find it "economically efficient to destroy excess supply of milk because the price is too low. Similarly, cattlemen may destroy a herd because beef prices are too low. Such practices are not permissible in an Islamic economy.

[16] We also assume $L, K, \frac{\partial f}{\partial L}, \frac{\partial f}{\partial K} > 0$

[17] For economic interpretation λ of please refer to any introductory mathematical economics text, e.g., Vickers (1968) chapters 10 and 11.

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